MANUALS OF THE HISTORY OF ART

ARCHITECTURE

Antiquity

By

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Illustrated by 148 Engravings, 13 Maps and 997 Diagrams

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INTRODUCTION.

III Of all the arts, the history of that of building is the one most difficult to write within the limits and in the sense of a manual. Since it is universal, it must have reference to that of civiliqation and of the mechanical sciences, as well as to geology, geography and climatology; it also comprises a considerable amount of technical explanations.

A clear sense of the necessity for reducing the matter to its essentials, and to introduce method in the compression, clarity and conciseness in explanations, have determined the conception of our undertaking, the extent of the inquiry, the arrangement of its plan, the method of analysis and the deiting.

However disproportioned the extent of this work may be to the enormous size and the complexity of the subject, we believe that nothing important has been omitted, and that the latest discoveries are included. Likewise the bibliographical notes for each section will aid access to the sources and to special studies.

We are ambitious to be useful to "laymen" as well as to professionals in furnishing to both classes of readers a kind of information, whose acquisition is as difficult as indispensable, in the present condition of artistic literature.

First we have endeavored to render accessible that knowledge of construction, which is so rare and without which it is impossible to fully appreciate the character and the beauty of an edifice. To succeed in this, we are compelled to explain much and to avoid all professional terms.

As for the architects, whenever we show how the product of a school has resulted from the place, the time and the purpose, we have especially regarded the interest to be found by them in meditating on these instructions from experimental e esthetics.

IV Our work has properly been substantially analysis and demonstration, excluding not only statements of personal "impressions" of no concern to the reader, but likewise descriptions interfering with the sequence, and also forbidden by our narrow limits. Moreover these are largely replaced by illustra-

illustrations. In return we have taken up chronology and monumental topography, because their determination is not always easy, and they are indispensable to the perception of relations and affiliations.

Our method must first be analytical; yet its aims are decidedly synthetic.

On the one hand, it adds to the usual definition of forms and states the explanation of structures and of functions, a and for a simple confirmation of the results, the statement of the conditions and the mode of obtaining them.

On the other, it admits of a desire to see entirely and fully how the means are always related to the aims, the diversity of the schools to the writing of the art, and the particular reality of artistic phenomena to the general idea of the esthetic law controlling them.

Besides, this tends to a presentation of the history of architecture in a dramatic form, so to speak; that of an immense effort of the different races of men and of successive generations to overcome the resistance of nature and the insufficiency of material and technical resources by the solution of problems proposed from the beginning.

To favor comparisons and make more evident changes and progress, as well as the laws controlling the art of building, for each of these elements has been reserved a symmetrical place in each section.

Corresponding to a historical unit, each section regularly comprises two inquiries in addition to its location in time and place, together with the determination of its rank in the entire series.

The first relates to the conditions on which depend the beginning and the bearings of the art of building; on the one hand, the human conditions -- relatiwe importance, the modal character of the requirements, whose schedule is equivalent to an inventory of notable monuments; national temperament, external influences, intervention of individuals, the state of science and of mechanics, the organization of the work -- ; on the other, the physical conditions, nature of the ground, climatic periods, resources in primitive materials.

[illegible] of them [illegible] the useful part of architecture, the object of it being the [illegible] of the programme and its [illegible] realization, that of the other treating of construction, considered in its materials and methods, the structure of the wall and of the isolated support, as well as the mode of covering.

[illegible]

[illegible] the theory, quality and nature of the materials; it d[illegible] [illegible], those of monuments; sculpture from those of [illegible]; it [illegible] the [illegible] and characterises the [illegible].

[illegible] the text, the illustrations are to be didactic. The selection of its contents is guided by the desire to [illegible] all typical aspects.

As for the very numerous sketches, they are not intended for artistic effect: their purpose is to make evident to the eye the characteristics and the classifications presented in the text [illegible].

The division of this work into three volumes, one being devoted to antiquity and the others to the middle ages and modern times, corresponds to an actual division of the course of [illegible] events. There may indeed be distinguished two stages, the first being constituted by conditions of a restricted area -- Asia in Mesopotamia and Africa, Egypt in the basin of the Mediterranean, with a relative unity of location, a dry and warm climate, scarcity of wood, with customs more or less oriental; the second having a variety of natural and human conditions, that cause the extension of the art of building into regions cold and wet, [illegible] and forested, with the intervention of new races and religions.

[illegible]

[illegible] which reflects the development of the primary ideas of [illegible].

The four books into which it is divided correspond to:--

The first to a long and obscure history, contemporaneous with the [illegible] of [illegible].

The second institutes three analyses.

Two of these relate to the useful part of architecture, the object of one being the preparation of the programmes and their realization, that of the other treating of construction, considered in its materials and methods, the structure of the wall and of the isolated support, as well as the mode of covering.

Finally the third concerns the agreeable element of the art, defining the energy, quality and nature of the effects; it d distinguishes those of harmonious order from those merely picturesque, those of monumental sculpture from those of ornamentation; it enumerates the usual motives and characterizes the style.

Like the text, the illustrations are to be didactic.

The selection of the engravings is guided by the desire to exhibit all typical aspects.

As for the very numerous sketches, they are not intended f for artistic effect; their purpose is to make evident to the eye the characterizations and the classifications presented to the mind by the text.

The division of this work into three volumes, one being devoted to antiquity and the others to the middle ages and modern times, corresponds to an actual division of the course of architecture. There may indeed be distinguished two stages, the first being characterized by confinement to a restricted area -- Asia in Mesopotamia and nearer, Egypt in the basin of the Mediterranean, with a relative unity of location, a dry and warm climate, scarcity of wood, with customs more or less oriental; the second having a variety of natural and human conditions, that cause the extension of the art of building into regions cold and wet, cloudy and forested, with the intervention of new races and religions.

As indicated by the adjacent diagram, the arrangement of this volume reflects the development of the primary phase of this evolution.

The four books into which it is divided correspond to:--

The first to a long and laborious infancy, contemporaneous with the neolithic age of mankind.

The second to an advance in the ancient Orient beginning at

the middle of the fourth millenium -- first and substantially in Egypt and Mesopotamia, then in the Hittite and Phoenician countries and in Canaan.

The third to a flowering existing in the Egean region (Archipelago, Greece, Western Asia Minor and Etruria), from about the 14 th century B. C. to the 3 rd century A. D. in two periods, at the Creto-Mycenaean epoch and the Prehellenic and H Hellenic times.

The fourth to two later productions derived from the preceding, those of Persia of the Achemenides,and of the Roman world.

January. 1911. Francois Benoit.

Not before the close of the glacial period was realized an economic and social state propitious for a rough sketch of civilization.

So long as the rigor of the climate had condemned him to the nomadic and precarious existence of the hunter, man was confined to an accidental shelter in a cavity of the rock or under a hut of branches; he took no thought for burial and his religious practices were confined at the bottom of a cavern, whose walls were decorated by forms of animals or "to[illegible]" [illegible].

But as a result of the milder temperature, a settled and agricultural life, by increasing and regulating the means of subsistence and by a proportionally closer [illegible], has determined the density of population and a political organization, without which could be no religious and organized life, so there was felt a necessity and a possibility of architecture, [illegible]

[illegible] of polished stone, there [illegible] constructions on land or lake, fragments of sacred constructions, tombs, -- artificial grottoes, dolmens, covered passages, -- and finally monuments [illegible] religious, -- menhirs, cromlechs and lines.

At the same time and favorable to the progress of art occurred a commercial traffic increased by a transfer of ideas and of products.

Thus in the course of [illegible] centuries was formed a [illegible] civilization of the ancient world, from the Atlantic to the Baltic, and from Scandinavia to the Soudan.

I. Mo[illegible], Chronology and Succession.

[illegible] which have succeeded each other, thanks to the direction of the [illegible] of this [illegible] of [illegible], to form possible an exact [illegible] of the domain of [illegible].

BOOK I. PREHISTORIC ARCHITECTURE.

1 Not before the close of the glacial period was realized an economic and social state propitious for a rough sketch of architecture.

So long as the rigor of the climate had condemned him to the nomadic and precarious existance of the hunter, man was satisfied with an accidental shelter in a cavity of the rock or under a hut of brinches; he took no thought for burial and his religious practices were fulfilled at the bottom of a cavern, whose walls were ornamented by forms of animals or "totems" painted thereon.

But as a result of the milder temperature, a settled and a agricultural life, by increasing and regulating the means of subsistence and by a prosperity creating needs, had determined the density of population and a political organization, without which could be no collective and trained labor, so t there was both a necessity and a possibility of architectura, undertakings. The more so, that to material progress corresponded moral advances -- beliefs producing rites, the conception of another life in the image of the terrestrial -- which introduced a demand for temples and tombs. Indeed from that distant epoch, termed neolithic or of polished stone, there remain some vestiges of habitations on land or lake, fragments of earth fortifications, tombs, -- artificial grottos, cists, dolmens, covered passages, -- and finally monuments undoubtedly religious, -- menhirs, cromlechs and lines.

At the same time and favorable to the progress of art occurred a commercial traffic increased by a transfer of ideas and of inventions.

Thus in the course of long centuries was formed a rudiment-
ary architecture, common in various degrees to all the buddi-
2 ng civilizations of the ancient world, from the Atlantic to
the Pacific, and from Scandinavia to the Soudan.

I. Monumental Chronology and Topography.

Too many milleniums, too many revolutions, too many improvements have succeeded each other, opposed to the duration of the poor and frequently fragile attempts of this infency of mankind, to make possible an exact limitation of the domain of neolithic architecture.

At most in the present state of knowledge may be noted that the area of prehistoric dolmens -- whose relationship appears incontestable -- forms an elongated zone from Ireland, Brittany and Portugal even to India and Japan, including in addition to the countries mentioned, England, France, Spain, North Africa, Scandinavia, North Germany, the Balearic islands, Corsica, Southeast Italy, Malta, Bulgaria, the Crimea, the North coast of Asia Minor, Syria, Southern Egypt, the Egyptian Soudan, the Caucasus and Persia. Certainly these different countries appear very unequal with regard to the abundance and importance of the monuments. The richest belong to Western and Northeastern Europe. At the head is placed France, divided into :-- Normandy -- the covered passages of Fontenay-le-Marmion (Calvados); the Anglo-Norman islands -- the dolmen of Ancresse on Guernsey; the Paris basin -- passage of Justice at Presles, artificial tomb grotto of Jouy-le-Comte (Seine et Oise); Champagne -- crypt of Mizy (Marne), caverns of the valley of Petit-Morin (Epernay); the West -- covered passages of Bagneux near Saumur (1), of Bournand near Fontevrault, dolmen of the forest of Boixe (Charente) etc.; the Southern borders of the central plateau -- dolmen of Livernon (Lot), cromlechs of Can-de-Ceyrac (Gard), covered passage of Collorques (Uzes); in the Southeast -- grotto of Fairies northeast of Arles, dolmen of Dragnignan; the Southeast Pyrenean dolmen called Caxa de Roland at Arles-sur-tech (eastern Pyrenees); Corsica AA dolmen called Stazzona de Fontanaccia near Sartene; but especially Brittany, particularly in Morbihan a and Finisterre -- lines and passage under the tumulus of Mont-Saint-Michel at Carnac, Fairy stone and dolmen of flat stones at Locmariaquer, menhir of Plesidy (Cotes-du-Nord), cromlechs of Er-Laric (Morbihan), covered passage of island Gavrinis (Morbihan) etc. In the second place fall the British Islands, thanks to the monuments of Scotland; of England -- cromlechs of Avebury, east of Bath, and of Stonehenge, north of Salisbury; of Wales -- dolmens called Arthur's Stone in the peninsula of Gower near Swansea and of Penter-Ifan in the county of Pembroke; of Ireland -- covered passage of New-Grange near D Drogheda etc. Likewise lengthy is the inventory of the neol-

megalithic structures of the Iberian peninsula, particularly in the north of Portugal -- dolmen called Lapa dos Mouses near Ancora, and in Spain -- covered passages of Antequara north of Malaga, and of Los Millares near Almeria. Also for Denmark, Schleswig and Holstein -- tumulus of Urby; for Sweden -- covered passage of Karleby; for Germany, etc.

Remains of huts on land exist in Germany -- settlement of Grossgartach east of Heilbronn; in Hungary -- settlement of Lengyel (county of Tolna); in Bosnia -- settlement of Butmir (east of Serajevo); in Greece -- settlement of Orchomene; in the Archipelago, etc., etc., while remains of lake dwellings are yielded by lakes in southeast France, Switzerland, northern Italy, southern Germany and Austria-Hungary.

It indeed appears that for the neolithic period the eastern basin of the Mediterranean was the location of a focus, whose rays were felt toward the West by way of the sea and toward the North by way of the Danube, the Moldau and the Elbe. This in nowise excludes the idea of original development in other adjoining countries, in similar conditions and with approximate results, yet inferior by reason of less favorable circumstances. Moreover, let us not forget, that in this Chapter chronological exactness is not less difficult than topographical. Not only are lacking assured data, but we also ri-
5 sk being deceived by the persistence of the methods and procedures of the neolithic period during the historical period, even to our own time among peoples either little gifted, fated, or outside the currents of civilization.[1] Referring to the more prudent computations of chronology, the passing of the prehistoric phase to the protohistoric period of architecture may be provisionally placed for Egypt at about the middle of the fourth millenium B. C., and for Crete some centuries nearer us.

Note 1. Compare the persistence of the dolmen among the Hovas of Madagascar and among the Khasias of Assam.

II. Programmes and their realization.

The dwelling of the neolithic man commonly consisted of a small hut, rather circular than square, and partly excavated in the earth. The progress of civilization gave rise to a

[illegible] ones, distinguished between a chamber with [illegible]-
[illegible] and often for corpse and a sleeping room; this differen-
tiation resulted according to locality in a division of the
[illegible]
as a sleeping room having a raised floor — or to several ad-
jacent cabins.

The essential part of a prehistoric tomb is a space generally [illegible]
[illegible]
[illegible]
form and dimensions of a chest; sometimes — then being term-
ed a dolmen — it presents those of a more or less straight
[illegible]
ft.; in height from 3.2" to 11.6 ft.; its entrance closed by
a slab, generally movable and often pierced by a round hole;
(S, XLVI; sometimes several sometimes exist. The chamber is fr-
equently preceded by a [illegible] or [illegible],
or less long and wide, usually straight, but sometimes bent:
on the island of [illegible] it measures 49.0 × 4.2 ft. (S, XVII);
at [illegible], 55.8 × 22.? ft. (?); at New Grange, 101.7 ft. (S,
IX; 7,9?). The ensemble of a chamber and an avenue takes the
name of covered passage.

[illegible] are [illegible]. — Except in case of extreme softness of
the rock — [illegible] to [illegible] tools were [illegible] as [illegible]
[illegible]
of Petit-[illegible] and those of Pouy-le-Comte. (S, XVI). Some
frequently are covered passages produced by placing a [illegible]
[illegible]
galleries of the Paris basin and those of South France. — [illegible]
[illegible] of [illegible] at [illegible] and [illegible]
near Arles being given as respective examples of the first a
[illegible]
on the surface of the ground. Only like the galleries menti-
oned above, it was generally concealed by a hill of small st-
ones, enclosed or not by a row of stones; such is the tumulus
of New Grange, with its diameter of 277.3 ft., or again, that
of Mont-Saint-Michel in Brittany, with its volume of about
353,000 cubic ft. (S,XII). In the plain of [illegible] [illegible],

rough arrangement, distinguishing between a kitchen with hearth and ditch for rubbish and a sleeping room; this differentiation resulted according to locality in a division of the hut into two rooms separated by a partition -- that for use as a sleeping room having a raised floor -- or to several adjacent cabins.

The essential part of a prehistoric tomb is a space generally square or rectangular, sometimes circular or polygonal (3). Sometimes -- then receiving the name of cist -- it has the f form and dimensions of a chest; sometimes -- then being termed a dolmen -- it presents those of a more or less spacious chamber, that may have an area of from 43 to more than 754 sq. ft.; in height from 3.28 to 11.5 ft.; its entrance closed by a slab, generally movable and often pierced by a round hole; (3, XIVU; adjacent caves sometimes exist. The chamber is frequently preceded by a vestibule or rather a corridor, more or less long and wide, usually straight, but sometimes bent; on the island of Gavrinis it measures 41.0 × 4.3 ft. (3,XII); at Bagneux, 65.6 × 23.0 ft. (1); at New Grange, 101.7 ft.(3, IX; 7,9″). The entirety of a dolmen and an avenue takes the name of covered passage.

Rare are grottos,-- except in case of extreme softness of the rock -- denied to men whose tools were miserable; as examples we cite the artificial sepulchral grottos of the valley of Petit-Morin and those of Jouy-le-Comte. (3, XVI). More f frequently are covered passages produced by placing a covering over a ditch excavated in the earth or rock; such are the galleries of the Paris basin and those of South France, -- t the alley of Justice at Presles and the grotto of the Fairies near Arles being given as respective examples of the first a and second.(3, XIII, XV). But the normal type is a structure on the surface of the ground. Only like the galleries mentioned above, it was generally concealed by a hill of small stones, enclosed or not by a row of stones; such is the tumulus of New Grange, with its diameter of 377.3 ft., or again that of Mont-Saint-Michel in Brittany, with its volume of about 125,550 cubic ft. (3,XIIU. In the plain of Southern Europe, dolmens and covered passages are frequently surrounded by an

enclosure of stones set to form a rectangle.

The monuments of the neolithic period, whose purpose seems not sepulchral, have the erected stone as a chief element. Sometimes these are single -- termed a menhir 66 in the form of a spindle or obelisk; sometimes several are grouped, either in a circle or in rows, forming in the first case an enclosure termed a cromlech, or in the second, alleys termed lines. Two adjacent stones of a cromlech are sometimes connected by a transverse monolith; it also occurs that small alleys precede the entrances.

Menhirs particularly abound in Brittany; that of Plesidy m measures 36.0 ft.; the Stone of the Fairies at Locmariaquer, now overthrown and broken, extended to more than 72.2 ft., t that of Penmarch here shown (2) rises 24.6 ft.

Cromlechs are numerous in France, England, Sweden and Denmark; we cite as examples:- in the first of these countries, at Er-Laric a pair of tangent circles with diameters of 180.5 and 196.9 ft., and those of Can-de-Ceyrac measuring across 311.7 and 321.5 ft., with small avanues before the gateways; in the second, that of Avebury covering 1076000 sq. ft., and that of Stonehenge about 98.4 ft. across with two concentric circles. (4).

As for the lines, they are peculiar to Brittany; the plain of Carnac has three in a series extending from East to West for a length of 1.86 miles; they comprise from 10 to 13 rows containing a total of 2700 menhirs. Two of these are connected with a cromlech, as sometimes occurs.

III. Construction.

Very poor were the technical resources of builders in the neolithic period. They doubtless possessed the pick, axe, adze, gouge and saw (5), made of flint or of some other polished stone; but the defective cutting of these instruments e excluded the power of shaping at will stone or even wood. They could not think of cutting the former, being satisfied with roughly reducing it by breaking off pieces by blows. There was likewise forbidden to them the freedom of execution r required by the simplest framing in carpentry.

Yet by patience, ingenuity, time and trained joint effort,

they acquired a relative power. Thus they knew the method of drilling or of sawing hard materials by subjecting them to the abrasive effect of grains of sand moved by rotation or
9 alternation; the practice of splitting stone by strongly heating the location of the desired split, following this by sudden cooling.

For transportation, sometimes to distances of more than 18.6 miles, for hoisting an setting enormous blocks having a weight sometimes of 4.45 to 5.58 tons or even of several hundred tons, they must replace the lack of mechanical means by the employment of thousands of men and by the artifice of progressive movements by the aid of the combined operations of embankment, excavation and swinging. (6). For example, their succession that produced a dolmen or covered passage was conceived as follows; first, the raising of the stones forming the lateral supports; second, the complete burial of these monoliths in the mass of an artificial hill extended in a gentle slope, a process with the double purpose of staying them and forming a means of access for the covering slab, then setting this in place; lastly, the excavation of the interior, or the total uncovering, if the programme did not comprise a tumulus.

Necessarily, wood and earth were the first materials utilized, and they continsed preferable for domestic structures; a hut was built of wattles covered with mud; a lake dwelling comprised only logs bound together with cords.

Toward the end of the period, at least in Eastern countries, Egyptian and Egean, appeared the use of unburnt bricks and of stone, the latter forming the indispensable foundation for a wall of clay.

For mounmental purposes were employed only stones. These were selected as large as possible, to reduce the labor of
10 cutting to a minimum. The height always and sometimes the width of a wall was composed of a single block with dressed surface and slightly inclined toward the interior. It was 1 likewise fortunate to cover a chamber with a single slab (7, 9); some exist as at Bagnieres, whose area exceeds 538.2 sq. ft. (7,II). Naturally the rough dressing of the stones was economically limited to their visible surfaces.

[illegible]

structures being filled with small stones and earth, the covering continued to require excessive space; for example, this [illegible] ns, of Solutions etc. (V. VI). area occurred, as proved by the "columns" of [illegible]-le-[illegible], of Jolicoeus, des Egl[illegible] [illegible] des Eglises etc., the invention of corbelling out the courses, permitting the reduction of the openings and consequently of the [illegible] (V, IV).

IV. The Church.

Without mentioning the necessity occurring in many cases to devote the [illegible] still to the solution of the problems of construction, the architecture of the neolithic man was almost out [illegible] the stage of pursuing properly artistic aims.

These efforts were denied to it; that of the orders by the total [illegible] of the [illegible]; that of the movement of [illegible] and of masses by the use of monoliths; that of the [illegible] of solids and voids by [illegible] [illegible] of construction; [illegible] [illegible] of columns by the [illegible] tools, which [illegible] [illegible]

Alone were permitted to it and yet in slight measure, those obtained by large dimensions and the application of geometrical decoration. We have seen, that it sought the [illegible] [illegible] [illegible] [illegible] nse, (5), or [illegible] sunken reliefs, such as are seen in the tomb grottos of [illegible] (5, XVI), or lastly, application of [illegible] [illegible] [illegible] [illegible] wavy lines and symbolical mixtures; exceptionally coarse representations of the human figure.

[illegible]

Yet doubtless by means of technical improvements, the builder in the last epoch of the neolithic period could reduce t the dimensions of his materials. Progress was at first limited to the supports, which became a pile of large stones, the crevices being filled with small stones and earth, the covering continuing to require excessive slabs; for example, this is shown by the passages of the "alleys"of Fontenay-le-Marmion, of Collorques etc. (7, V). Then occurred, as proved by the "chambers" of Fontenay-le-Marmion, of Collorques, New Grange, Los Millares etc., the invention of corbelling out the courses, permitting the reduction of the openings and consequently of the covering slab.(7, IV).

IV. The Effect.

Without mentioning the necessity occurring in many cases to devote the entire art and skill to the solution of the problems of construction, the architecture of the neolithic age w was almost outside the stage of pursuing properly esthitic a aims.

Most effects were denied to it; that of the orders by the fatal meanness of the programme; that of the movement of lines and of masses by the use of monoliths, that of the contrast of solids and voids by the forced timidity of construction; that resulting from the intrinsic beauty of choice materials by the difficulty of transportation; that depending on perfection of cutting by the insufficient tools, which for a still stronger reason excluded sculpture.

Alone were permitted to it and yet in slight measure, those produced by large dimensions and the application of adventitious decoration. We have noted, that it sought the first; as for the second, it required either engraving, specimens of w which are presented by the stones of Gavrinis and of New Grange, (8), or formless sketch reliefs, such as are seen in the tomb grottos of Champagne (3, XVI), or lastly, application of colors in the style of those showing traces at Grossgartach.

The motives are geometrical fancies, especially repeated w wavy lines and symbolical hatchings; exceptionally coarse representations of the human figure.

In summation; however rudimentary it remained, neolithic a

architecture realized all the progress permitted by its exclusively stone tools, and it endowed mankind with the essential elements of the art of building; formulas for the preparation of tamped earth and the making of bricks, processes for stonecutting, methods for raising and transporting the heavier masses, the framing of wood, and the expedient of corbelling.

We present together the architecture of Egypt, of Mesopotamia and of nearer Asia (Hittite, Canaanite and Phoenician), because they all belong to the same historical period, to the same stratum of civilization, and their influence relations unite them.

It has seemed proper to place in a first Part the great elder styles, the beginners that broke the paths.

Tradition commences in Egypt a history of architecture.

In truth, there are strong presumptions, that to Mesopotamia belongs the honor of the beginning. Particularly the fact, that several things common to the architecture of Mesopotamia and to that on the banks of the Nile during their early stage were then retained by the former and abandoned by the latter,[1] leads one to think them essential to the first, being its own invention.

Note 1. Such as to construct exclusively with bricks and to realize relief on the walls by means of alternating pilasters and recesses.

Very well, if our knowledge of its productions equaled that of Egyptian monuments possessed by us, the architecture of M Mesopotamia would doubtless be accorded a right to preeminence superior to what constitutes chronological priority; for it holds the originality and the efficiency of several processes, as well as obligations more or less on all later schools, comprising the Western and the Modern.

However, in the uncertainty of the science and likewise the advantage possessed by the Egyptians over the Mesopotamians in having practised, almost as early as the latter in bricks,
13 construction in stone, when nature refused the material to t the second, we shall retain the customary order of presentation. Hence the two rivals cannot be opposed in competition. In spite of some exchanges in which Egypt appears to have received more than it gave, their careers were determined by d different physical fortunes, were distinct and extended in p parallel development.

A second Part groups in a second series the architectural styles practised by the Hittites in Asia Minor and Northern Syria, and by the Amorites, Canaanites, Phenicians and Israel-

Israelites in central and southern Syria. Compared to those of Egypt and of Mesopotamia, they not only appear youthful -- younger by at least a thousand years -- not only inferior but derivative. Yet their place is marked in the history of the art of building, because they actively contributed to the diffusion in the West of some inventions in Mesopotamia and Egypt, and since on their own account, they prove to a certain degree ingenuity and creative power.

14 PART I. ARCHITECTURES OF EGYPT AND MESOPOTAMIA.

Section I. Egyptian Architecture.

Chapter 1. Requirements. -- Topography and monumental Chronology.

Limited to the delta of the Nile and the narrow strip of t the valley extending to the borders of the Soudan, the area of Egyptian architecture is very restricted. Yet with regard to the number and the quality of the monuments, Egypt fears no comparison. The conditions were excellently propitious for the art of building, both those of the human and the physical order.

I. The Requirements.

A first Egyptian architecture benefited by the number and the importance of the works proposed for it.

In reality its civil career was relatively mediocre. No demand for civic purposes. Even the capital, a city on the banks of the Nile, was never more than a confused mass without comforts or conveniences, and never containing edifices of p public utility.

The same was true of domestic architecture:- occasion for monumental works was lacking. The mildness of nature in the oriental climate reduced the need of shelter to a minimum; f further, customs excluded the Western conception of a durable
15 and hereditary dwelling, none caring to succeed a dead person, and the pride of the prince requiring a palace erected especially for himself. Then resulted a system of construction f for one life only, therefore slight and eminently perishable, confirmed in Egypt by the fact, that to employ the expressions of Diodorus of Sicily, "life was regarded as a small affair, and considering the brief time that one remained, houses

[illegible] as well as the afterlife.

As for military architecture, the need for it was created by the vicinity of near or warlike peoples, by the results of a [illegible] policy of conquest, and at certain epochs by the division of the country into rival principalities.

It [illegible] had much to do to supply an enormous demand for temples and tombs.

[illegible] the "[illegible] of the Gods"; those estates, each district having its own, dominated by certain [illegible] deities [illegible] to the entire country. For [illegible]

[illegible] of architecture. [illegible] of the end, he asserted his [illegible] origin [illegible] toward his [illegible] by erect- [illegible], or by [illegible] some of those built by his predecessors. [illegible] of the [illegible] [illegible] [illegible]

[illegible], and called for the [illegible] of all [illegible] of the [illegible].

[illegible]

According to the Egyptian beliefs, man could save [illegible] not only [illegible] toward the [illegible] of a [illegible] the [illegible] "[illegible]", but also [illegible] of the [illegible] individuality, [illegible] that these survivals were assured [illegible] on the one hand, on the other of [illegible] to [illegible] and the [illegible] of this [illegible] that [illegible] was provided for in [illegible] the [illegible], the figures to [illegible], in [illegible] and finally in [illegible] it with [illegible]

[illegible]

were inns", When these were royal, these "inns"were vast, or-derly and luxurious, and in their construction art found its place as well as the architect.

As for military architecture, the need for it was created by the vicinity of poor or warlike peoples, by the results of a frequent policy of conquest, and at certain epochs by the division of the country into rival principalities.

In return, Egyptian art had much to do to supply an enormo-rmous demand for temples and tombs.

According to Herodotus, the "Egyptians excelled all men in the worship rendered to the gods"; those swarmed, each distr-ict and each city having its own, dominated by certain supre-me divinities common to the entire country. For them alone, the devotion of the Pharaoh sufficied to support a religious architecture. Son of the sun, he asserted his august origin and his filial piety toward his celestial benefactor by erect-ing a sanctuary, or by embellishing some of those built by h his predecessors. And the importance of the programmes incr-eased equally with the number of demands; complicated and pom-pous, endowed with immense revenues, the Egyptian religion r required ample and wise arrangements, magnificent decorations, immense appendages, and called for the display of all resour-ces of the art.

Meanwhile Egyptian architecture had no better patrons than the dead.

According to the national beliefs, man could save from dea-th not only a soul taking its flight toward the country of s spirits in the distant"West", but also a "double" of his per-sonality, provided that these survivals were assured of actu-al support on the one hand, on the other of the power to ret-ain in the beyond the condition and the customs of this side; that twofold requirement was provided for in embalming the body, in conforming the figures to its effigy, in gratifying the dead by offerings, and finally in supplying it with furn-ishings and an image of its property, its dignities and its pleasures.

As much as to say, that the survival depended on the solid-ity of the tomb and on its accurate adaptation to its destin-

destination of a "house or temple for eternity". Doubtless t the poor were hastily buried, badly or not embalmed, in common pits and between layers of sand. But for every man slightly elevated, the construction of a sepulchre was the principal affair of his life. The first care of a sovereign was the choice of a site for the "dwelling in which he should remain", the adoption of a plan, and the commencement of the work; [1], besides, tha fact that this "image of Ra among the living" after death became associated with Osiris, required the organization of a solemn sepulchral worship, and consequently the erection of a temple.

Note 1. It indeed appears that the sovereigns, who built great pyramids, began by ensuring for themselves a modes monument in case of early death, which they later enlarged by o one or more coverings of masonry, with or without alteration of the internal arrangement of the original nucleus.

If it be added that Egypt never knew the family sepulchre common to several generations, that each individual had his own for himself, his wife and children, it is not surprising that the valley of the Nile is encumbered by tombs. The cities of the living have almost disappeared, but those of the dead remain, true cities divided by streets into quarters. To merely cite the principal examples, such are the vast cemeteries of Memphis, which from Gizeh through Abousir and Saccara to Daschour follow each other for a distance of more than 18.6 miles and a breadth of 0.3 to 1.25 miles; that of Abydos, immense and consecrated by the presence of the mummy of Osiris and the vicinity of the "opening", the entrance to the "realm of the West"; finally, that of Thebes, so expressively named "in the presence of his master", with its divisions of Biban el Molouk, of the Valley of the Queens, of Assasif, of Kourna, and the memory of its forty seven funerary temples.

II. Monumental Topography and Chronology.-- The Periods. -- Radiation.

In the course of the forty centuries during which at least ancient Egypt continued, architectural production was not necessarily more uniform with regard to the number than to the quality. It is and always will be impossible to make an acc-

[illegible] history by periods, not only on account of the [illegible]
[illegible] of numerous documents, but also because of the [illegible]
[illegible] their [illegible], which [illegible]
[illegible] restored, as well as to employ for their uncer-
[illegible]

In the economic history of Egypt may be distinguished [illegible] periods.[1] A first was recently revealed on the [illegible] [illegible] of the two [illegible], whose [illegible]; it [illegible] about [illegible] B. C. and ended about [illegible] B. C. A second comprises two sections of Egyptian his- [illegible] to about [illegible]. The third corresponds to the [illegible] the [illegible] of the [illegible]. The last is contemporaneous with the [illegible] of which were [illegible] the II to [illegible]

[illegible]

[illegible] back to the prehistoric past of Egypt -- [illegible] most [illegible] to [illegible] the people of the [illegible] in both the [illegible] of activity and [illegible] of [illegible]. These are [illegible] the venerable [illegible] I and II dynasties, [illegible] at [illegible]

[illegible] of [illegible] temple built [illegible]; [illegible] between [illegible] and [illegible] people of the [illegible] etc.

[illegible] III dynasty -- [illegible] of the [illegible]

accurate inventory by periods, not only on account of the ruin of numerous monuments, but also because of the custom of the Pharaohs to place their cartouches on edifices, which they had merely restored, as well as to employ for their undertakings the structural materials of former buildings.

In the monumental history of Egypt may be distinguished four great periods. [1] A first was recently revealed on the limits of the protohistoric epoch, that of the two first dynasties, which reigned in This, and of the third, whose capital was Memphis; it commenced about 3300 B. C. and ended about 2900 B. C. A second comprises two sections of Egyptian history termed the Ancient and Middle empires, extending from about 2900 to about 1800. The third corresponds to the New empire and has for its limits the beginning of the 16 th century B. C. The last is contemporaneous with the long period in the course of which there followed from the 11 th century B. C. to the 4 th A. D., first the dynasties that reigned in the delta, at Sais and at Bubastis, then the government of the P Ptolemies, and finally that of the Roman empire.

Note 1. We follow the chronology of Meyer. According to Mariette, the initial date should be carried back to 5004; by Flinders Petrie to 4800; by Brugsch to 4445; by Lepsius to 3892.

I. First period (about 3300 to about 2900). -- However far one goes back in the historical past of Egypt -- according to the most moderate calculations to about the middle of the fourth millenium before our era --,one finds in both the lower and the upper country proofs of activity and soon of architectural science. These are furnished by the venerable ruins of monuments, contemporary with the I and II dynasties, discovered at Negadeh below luxor (Tomb of king Men); at Nezlet Batran near Gizeh (tombs of the reign of Zet); at Abydos (tombs of the reigns of the Pharaohs Den and Qua of the I dynasty; of the kings Perabsen and Kasekhemmi of the II); at Kom el Ahmar (Hierakonopolis below Edfou; Temple built by king Khasekhemmi); at Zanet el Aryan between Gizeh and Saccara (unfinished Temple of the Pharoah Nofir Ka) etc.

Under the III dynasty -- at the beginning of the third millenium -- commenced the exact orientation of Egyptian archit-

[illegible], at the same time as [illegible] its
[illegible] to [illegible] by
the [illegible] of [illegible]

[illegible], the [illegible] of [illegible]; in the second the [illegible]-
[illegible]
of the [illegible] (about 2500).

II. Second Period (about 2500 to about 1800). — In the [illegible] of the IV dynasty (about 2900 to about 2750), [illegible] of their [illegible], [illegible] a [illegible] of its [illegible] [illegible] Osiris, [illegible]

The [illegible] and the quality of the productions of the time of the V dynasty (about 2750 to about 2625) are shown in the [illegible] of [illegible] by the Pyramid of [illegible] and by the Temple at [illegible], which that prince dedicated to [illegible]

[illegible] at Kom el Ahmar (Hierakonpolis) by [illegible] of a city.

The [illegible] of the VI dynasty [illegible] at Coptos in the upper country.

[illegible]

The same praise is merited by those [illegible] by the [illegible], calm and prosperous under the sovereigns of the XII dynasty (about 2000 to about 1800). The [illegible]

[illegible]

[illegible] Usertesen I and Usertesen II

architecture, at the same time at which became emphasized its progress in the art of design and of construction; proved by the excavated tombs at Bet-Khallaf and at Regnaquah opposite 19 This, at Saccara, Meidoum, and more particularly in the first necropolis, the Mastaba of Noutirkha; in the second the stepped Pyramid of king Zoser; in the third the stepped Pyramid of the Pharoah Snofrou (about 2900).

II. Second Period (about 2900 to about 1800). -- In the service of the princes of the IV dynasty (about 2900 to about 2700), more powerful than any of their predecessors, Egyptian architecture exhibited a new development of its tendencies a and its abilities in erecting at Gizeh the tombs (pyramids)of Cheops, Chefren, Mycerinus, and the funerary chapel of Chefren, called "Temple of the Sphynx" or "granite temple".

The importance and the quality of the productions in the t time of the V dynasty (about 2700 to about 2600) are proved in the region of Abousir by the Pyramid of Neouserre and by the Temple of Abou Gourab, which that prince dedicated to the sun; at Saccara by the Pyramid of Ounas and by notable tombs, such as those of Ti and of Ptahhotep; at Abydos by the Fortress named Kom es Soultan; at Kom el Ahmar (Hierakonopolis) by a fort; at El Kab by the wall of a city.

The architectural works of the epoch of the VI dynasty have been badly injured; their quality are however shown by the P Pyramids of Teti I and of Pepi I at Saccara, and by the remains of temples discovered in the region of the delta at Bubastis and Tanis, and at Coptos in the upper country.

These monuments of the Ancient empire manifest a conscientiousness, knowledge and an artistic feeling never surpassed.

The same praise is merited by those multiplied by Egypt of the Middle empire, calm and prosperous under the government of the XII dynasty (about 2000 to about 1800). The taste for beautiful materials, particularly for granite, and the care for perfect execution distinguishes the little, that the ravages of the Hyksos and especially the rebuilding and the plunderings of the Pharoahs of the New empire have spared from w what was built by Amenemhet I, Ousirtasen I and Ousirtasen II -- the Sesostris of the Greeks --, Amenemhet III; the great

[illegible] of such as Karnak, Luxor, etc.: [illegible]

[illegible] with such great [illegible]

[illegible] on the frontier of [illegible]

[illegible] of Semneh [illegible]. For themselves, the [illegible] of [illegible]

[illegible] as at Edfu, the [illegible]

[illegible] of the [illegible] of the [illegible]; at Deir-el-Bahari,

[illegible] of the [illegible] of the originality of the [illegible] art.

[illegible]

into the country as a result of the invasion of the Hyksos.

[illegible]

[illegible] and snowy [illegible], masters of immense resources in war and

[illegible]

[illegible].

The time of this renaissance is divided into two periods, [illegible] by special quality of execution.

To the first belongs the structures of the XVIII dynasty (1580 - 1350) and to the first period of the XIX dynasty ([illegible]) to about 1250). [illegible] several works carefully exam[illegible] and of high artistic value. [illegible] according to the [illegible] which [illegible] with [illegible] by means of its [illegible] into [illegible].

[illegible] the great hall, erected by Thothmes I, other [illegible] and Thothmes III (1503-1449); in the [illegible] is at Deir el Bahari is an imposing funerary temple for [illegible] of Thothmes III and Hatshepsut; at Medinet [illegible] at Deir-el-Bahari [illegible] by the same [illegible] of the [illegible] of [illegible].

sanctuaries at Tanis, Bubastis and heliopolis; Temples of Osiris at Abydos; of Amon at Karnak, Luxor, etc.; pyramids at Daschour, Illahoun, Haouara and Licht; funerary Chapel of Amenemhet III at Haouara with such great dimensions and so complex an arrangement, that it appeared to the Greeks as a mysterious "labyrinth"; city at Kahoun; fortress at Abydos (Shounet es Zebib), on the frontier of the Soudan (forts of Semnen and of Koumeh) etc. For themselves, the vassal princes of u upper Egypt desired tombs in proportion to their rank; such as at Siout, the tombs of local noblemen; at El Bersheh, those of the masters of the nome of the Hare; at Beni-Hassan, those of the sovereigns of the principality of the Gazelle etc.

III. Third Period (16 th to 11 th centuries). -- After a period of depression contemporary with the great crises affecting the country as a result of the invasion of the Hyksos, when the New empire had restored favorable conditions about 1550, Egyptian architecture assumed a new flight, urged more strongly than it had ever been previously by warlike, glorious and showy kings, masters of immense resources in men and materials, and by an opulent people, exalted by the national grandeur.

The time of this renaissance is divided into two periods, distinguished by unequal quality of execution.

To the first belongs the structures of the XVIII dynasty (1540 - 1350) and of the first period of the XIX dynasty (1350 to about 1292). These are in general works carefully executed and of high artistic value. Some betray Asiatic influences according to the relations which Egypt had with Syria and Mesopotamia by means of its expansion into Asia.

First at Karnak is the part of the great Temple of Amon behind the great hall, erected by Thoutmosis I, queen Hatshepsouet and Thoutmosis III (1540-1447); in the Theban necropolis at Deir el Bahari is an imposing funerary Temple for the worship of Thoutmosis III and Hatshepsouet; at Medinet - Gourab near Illahoun are the remains of a city founded by Thoutmosis III; at Beni-Hassan and excavated by the same sovereigns is a subterranean Sanctuary of the goddess Pekhet, better known under the name of Speos Artemidos. To Amenophis III

(about 1411-1370) are due another at Luxor, the Temple of the
triad of Amon, Mout and Khons; another at Medinet-Habou near-
ly destroyed, but whose entrances continued to be marked by
two colossal statues celebrated in antiquity under the name
of the colossi of Memnon; in the island of Elephantine the
memory of two charming chapels fortunately determined by eng-
ravings, dedicated to Khnoumon and destroyed about 1822-1825.
A.D. However ruinous it may be, Khanit Aten, the temporary
capital that the heretic Amenophis IV (1370-1358) created for
himself, on the actual site of Tell-el-Amarna, where he apos-
tasized from the worship of Amon and abandoned Thebes, is sin-
gularly interesting to us on account of its palaces and hous-
21 es. Finally on account of the powerful Seti I of the XIX dy-
nasty (about 1315-1292) figures the great hall of the Temple
of Amon at Karnak, one of the marvels of the national art; t
the covered nave of the Temple at Luxor, taken from a rival
structure; funerary temples at Kourna and at Abydos; one of
the principal subterranean tombs of the group at Biban el Mo-
louk in the Theban necropolis.

Thenceforth is a marked tendency to prefer grandeur to beau-
ty and to neglect the construction, which rapidly developed
the worst results in the course of a period commencing with
the reign of Ramses II (1292-1225). If Egyptian architecture
had desired to proceed conscientiously, it could not have re-
sponded to all demands lavished by the building fever of that
monarch. From the Mediterranean to the borders of the Soudan,
he restored, completed, rebuilt or created. At Tanis, he er-
ected a Temple of Seth, now ruined; at Bubastis, he transfor-
22 med that of Bastet; at Memphis, on the national sanctuary of
Ptah were works, whose memory is preserved by two colossal f
figures in his image; at Saccara, he excavated the first gal-
leries for the burial of Apis, the Serapeum; without mention-
ing the tomb prepared for his mummy at Biban el Molouk, he e
erected for himself in Abydos two funerary temples, one of w
which is the famous Ramesseum; at Karnak, he enclosed the gr-
eat Temple by a wall; at Luxor, he pleased Amon by a court
with porticos and an enormous pylon; in lower Nubia, he comm-
emorated his journey by the evidence of subterranean temples,

[illegible]

[illegible] the great centre of [illegible] etc.

Under his successors, architecture suffered by the Persian [illegible]

[illegible] funerary Temple, connected [illegible] passage; at Tell el Yahudiya, north of Cairo, [illegible] distinguished by the peculiarity of enamelled decoration.

[illegible]

[illegible] difficulty, [illegible] of any opportunity for enriching itself at the expense of Asia and of the Soudan, and [illegible] always [illegible], it almost always [illegible] merely the oasis for [illegible]

To be noted:- addition of a court with porticoes to the great Temple at Karnak by Shoshenk I, the first of the Libyan princes of the XXII dynasty ([illegible]), and further [illegible] the Temple of Bast at Bubastis, their capital; enlargement of the Temple of [illegible] at Karnak by the Ethiopian [illegible] (XXV [illegible]

erection of a kiosk in the first court of the Temple of Amon [illegible]

[illegible] a decorative [illegible].

[illegible]) was a revival of [illegible], a revival of architectural decorative and a renaissance of art. At Sais itself [illegible] of the [illegible] monuments [illegible] the [illegible] of Herodotus, [illegible] which have [illegible] by the Nile, and [illegible] utilized as [illegible]; the Temple of [illegible] at [illegible] by Psammetik, [illegible] the cost of [illegible]

[illegible] were [illegible] the tombs of [illegible] of [illegible],

particularly that of Ptah at Gerf Hossein and those of Harakhte and of Hathor on the steep banks of Ipsamboul etc.

Under his successors, architecture suffered by the decline from the Egyptian grandeur. Both were restored by the great Pharoahs of the XX dynasty, Ramses III (1200-1179), creator of a Temple of Khons at Karnak; of a superb Tomb at Biban el Molouk; at Medinet-Habou, a great funerary Temple, preceded by a triumphal gateway; at Tell el Yahoudieh, north of Cairo, by a Temple distinguished by the peculiarity of enameled decoration.

IV. Fourth Period(11 th century B.C. to 4 th century A.D.). With the reign of Ramses III closed the heroic age of Egyptian architecture. Henceforth the country was reduced to its own territory, and was deprived of any opportunity for enriching itself at the expense of Asia and of the Soudan, and its kings being weakened and always menaced, it almost always lacked the means and too frequently the taste for building. As the results of five centuries only unimportant undertakings are to be noted:- addition of a court with porticos to the great Temple of Karnak by Sheshonk I, the first of the Libyan princes of the XXII dynasty (945-745), who further completed the Temple of Bastet in Bubastis, their capital; enlargement of the Temple of Ptah at Karnak by the Ethiopian Shabako (XXV dynasty; 712-700); by his successor Tanarqua (688-663) the erection of a kiosk in the first court of the Temple of Amon and a Chapel of Osiris.

Quality should compensate for quantity, but in all respects a decadence occurred.

Yet under the Saitic sovereigns of the XXVI dynasty (663-525) was a renewal of prosperity, a revival of architectural demands and a renaissance of art. At Sais itself were erected by the orders of Psammetik I and of Amasis, monuments that aroused the admiration of Herodotus, but which have vanished, washed away by the Nile, and especially regularly utilized as quarries of dressed stones; the Temple of Ptah at Memphis was finished by Psammetik, who likewise met the cost of a considerable extension of the Serapeum of Saccara; in the Theban n necropolis were excavated the tombs of the quarter of Asasif,

[illegible]

[illegible] of the period of the [illegible], the [illegible] revived the [illegible] of the first period; they sought beautiful [illegible], dressed them tastefully, without fear of dimensions [illegible] previously established heretofore, and they restored the freedom and elegance characteristic of the ancient style.

[illegible] century, and of the 5 th and the first [illegible] were sterile, as a result of the conse- [illegible] caused [illegible] the conquest of Egypt by the Persians (525).

[illegible]

[illegible], [illegible] to architecture because it coincided with a complete development of the worship of Is- [illegible]

[illegible] Sebennytos, [illegible] (the Iseum of the [illegible]) for [illegible] again Nectaneb- [illegible] built on the island of Philae a Sanctuary dedi- [illegible]

[illegible] sis.

At the same time a colony of Egyptian architecture flour- [illegible]

[illegible]

[illegible] the [illegible] of his [illegible] the chief [illegible] of his son [illegible], the Temp- [illegible]

As for the Ptolemies, [illegible]

[illegible]

[illegible] of 2 [illegible] which [illegible] the [illegible], [illegible] were [illegible] in the island of Philae, the Temp- [illegible]

[illegible] by [illegible] II [illegible] were [illegible] the [illegible] Temple of Edfou, erected by Ptolemies I and

some of which exceed in dimensions those of the New empire.

Reacting against the excesses and the negligences of the school of the period of the Ramses, the builders revived the sane methods of the first period; they sought beautiful materials, dressed them perfectly, without fear of dimensions whose enormity astonished Herodotus, and they restored the freedom and elegance characteristic of the ancient style.

The end of the 6 th century, all of the 5 th and the first quarter of the 4 th were sterile, as a result of the depression caused by the conquest of Egypt by the Persians (525). But to the accession of the XXX dynasty corresponds a national elevation, the more favorable to architecture because it coincided with a remarkable development of the worship of Isis-Hathor. To her Nectanebes (378-361) dedicated a magnificent Temple at Behbit el Hagar, near his capital Sebennytos, now ruined (the Iseum of the Romans); for her again Nectanebos (358-341) built on the island of Philae a Sanctuary preceded by a portico; without mentioning numerous secondary structures in the entire extent of the country, all of excellent quality.

At the same time a colony of Egyptian architecture flourished in Ethiopia, whose memory is preserved by the pyramids of Meroe, showing the character of frank and barbaric imitation.

Ptolemaic Egypt (285-21) remains a select country for architecture.

Alexander the Great marked his brief sojourn by ordering a "Chapel of the Boat" for the sanctuary of the Temple of Luxor, and of the brief reign of his son Philip Archideos, the Temple of Amon at Karnak retains a trace in its "granite chapel". As for the Ptolemies, they multiplied throughout all Egypt t the evidences of a devotion addressed particularly to Isis-Hathor. These were not merely embellishments, like the addition of a great pylon to the Temple of Amon at Karnak, but were a also creations. Such were in the island of Philae, the Temple of Esculapius by Ptolemy Philadelphus (285-247) and that of Isis by him and by Evergetis (247-222), also that of Hathor by Philometor and Evergetes II (181-117). Such were again the magnificent Temple of Edfou, erected by Evergetes I and

Philopator (285-206); those of Deir -el-Medine at Thebes and of Dakke in lower Nubia, commenced by Philopator (247-205); the Temple of Khnoum at Esne and that of Sobek and of Haroeris at Kom Ombo by Philomotor (181-146). The half Temple of El Kab for the worship of the goddess Nekhbeyet, and a Sanctuary of Osiris at Karnak, recall the reign of Evergetes II ((146-117), while the vast Temple of Hathor at Denderah owes its foundation to Neos Dionysos (80-52).

Even in Roman Egypt art was not idle; in truth it was particularly occupied with the completion and decoration of edifices more or less advanced by the last Ptolemies. Yet a Temple in the island of Philae, another at Dendour, a third at Kalabghe south of Assouan, date entirely from the imperial p period.

In spite of the permeation of Hellenism, which favored the the origins of the Ptolemaic dynasty, Egyptian architecture remained till the close of its career faithful to the national tradition. In a general way its latest creations are notable for care in execution and by the life, sometimes rather exuberant, but often very happy in its decorative invention.

The radiation of Egyptian architecture was considerable. Central and southern Syria -- particularly Phoenicia -- and Cyprus were dependent on it. Mesopotamia did not escape its influence, which was also exerted on the Egean civilizations, comprising therein the Hellenism in its Doric species.

Chapter II. Natural, Human and Technical Conditions.

The conditions that architecture found in Egypt were most favorable to its development, as we have already stated.

I. Natural Conditions.

Those of a physical nature were entirely propitious. And first it had at command rare facilities for the supply of its materials.

The country is certainly very poor in wood, and the little that it possesses is of a quality more than mediocre; there is the palm, which is fibrous, impossible to cut into the members of a framework, and incapable for resisting flexure as well as crushing; the sycamore, that lacks density and strength; the acacia and the tamarisk are better, but only furnish pieces of small dimensions. However, at least for careful c construction, the adjacent coast of Syria, with the convenience of maritime transportation, offered the formerly immense resources of its forests of cedars and cypresses.

The lack of wood is also largely compensated by the abundance and excellence of the elements of construction in bricks or in stone.

The mud of the Nile is compact and dries very hard, being nearly incompressible.

Everywhere the steep banks bordering the valley contain stone, and in many places they afford in some kinds the finest specimens known.

26

Limestone is found in the Arabian range for its entire length. The principal quarries are;- in upper Egypt, that of Djebel Silsileh on the eastern bank of the river; in middle Egypt, at Djebel Abou, Het Noub and El Kosseir; in the low c country, in the vicinity of Cairo are those of Masara, Toura and of the Mokattam, where abounds stone, admirable for its fine texture and the perfect polish it can receive.

The eastern hills of Djebel Ahmar near Cairo and the western at the north of Assouan are rich in sandstone.

Alabaster is easily obtained from the Arabian range from D Djebel Masara near Cairo to Siout, particularly at Het Noub and El Kosseir.

Finally in the Libyan range can be quarried enormous blocks of hard stone of very dense texture and in various colors; t

the most beautiful are taken from the quarries of Wady Hammamat, which supply a dark granite, and especially in the region of Assouan (formerly Syene), rich in splendid materials, quartz and mica, yellow, brown, reddish and black.

Another favor of nature to architecture is the exceptional convenience of transportation in Egypt. The slimy soil of t the valley aids the sliding of the sledges, and the Nile is one of the most useful of the "moving roads", since the inhabitated places are in great numbers along its banks, and for the others, nothing is easier than connection by a canal, when communication does not naturally occur in a flood.

Egyptian architecture further benefits by the extraordinary dryness of the local atmosphere, assuring on the one hand the preservation of unburnt bricks, and on the other the almost indefinite duration, not only of sculpture but also of painting, even underground, favoring both construction and decoration. Add an intensity of light, such that the problem of the lighting of interiors is practically suppressed, a very small opening sufficing to light a vast hall.

It is true that opposed to these advantages are the difficulties caused by the extreme narrowness of the upper valley, in some places not permitting a building under the open sky [1]; (see pages 46; 47; 57; 58); the instability of the alluvial soil, always more or less undermined by the infiltration from the Nile; finally the corrosion of stone by nitre in solution in the waters of the floods.

II. Human Conditions.

The conditions of the human order were relatively natural.

Architects, foremen and workmen were readily obtained through the moral, social, political and economical condition of 28 Egypt. The dignity assigned by custom to the architect -- it was practised by princes of the royal blood, and the chiefs of the official building service were counted among the highest dignitaries of the state -- was suited to exalt those practising it, as well as to attract superior men.

Naturally industrious and excellently trained by regular specialization into an organization of labor by incessant practice, the race furnished excellent workmanship. Finally in

case of great need, kings, princes and noblemen controlled a numerous and submissive people, which could be levied at pleasure, that the hydraulic nature of the Nile permitted to be used largely without injuring the prosperity of the country, and to which the power of the empire of the Pharoahs added at times multitudes of captives in war.

Note 1. Indeed, besides the culture of a soil periodically fertilized by the Nile, where the planting required scarcely any preparation and thus was not very pressing, the inundation compelled the peasant to idleness during a quarter of the year.

In Egypt the technical and artistic condition of architecture was fated, determined largely by certain physical and human peculiarities. And first in no country have the nature of the materials, the appearance of the landscape, the sky a and the climate have more despotically imposed the system of construction, the effects of form and decoration in accord with their characteristics.

Because the monumental productions of Egyptian architecture depended exclusively upon wealthy sovereigns, grown old in absolutism and often in military glory likewise, there must result a tendency to prefer material grandeurto perfection, a desire for exciting impressions, strong rather than refined, to astonish rather than satisfy the eye and the mind; finally the need of fulfilling the demand at any cost. The excessive importance of the undertakings, a result of the origin of the demand, and the ordinary effects of direct execution by the government, by workmanship too frequently dominated by unprofessional levies, necessarily introduced opportunities for error, for negligence and bad work. Finally on account of i its official condition, Egyptian architecture was devoted to conservatism and to formula, just as it was elsewhere condemned by the rule of the community, carefully closed and strictly specialized, which was that of free labor.

It could not depend upon the national temperament; affected for good or evil by what it comprised of submission, of simplicity and of carelessness -- these qualities excluding boldness, initiative and system, as well as regularity and accur-

[illegible]
vicinity bounded in sands, which made it skilful in avoiding difficulties.

VII. Technical Conditions.

[illegible] was an enormous ingenuity, fertile in practical expedients. Those men that astonish us by the colossal proportions of so many of their edifices, by the number and extent of their excavations, by the perfection of their work of the as- [illegible] ably applied, once with rudimentary tools and ignorant of the most primitive of our machines.

The drawing of an ellipse done in ink on a plaster [illegible] belonging to the Tomb of Ramses VI at Biban el Moluk (12 th century B.C.) shows, that they knew how to trace [illegible] of [illegible] calculations, and did not embarrass themselves by exactness in the measurements. "It is necessary", remarks [illegible], "to have measured with measure in hand the temples and [illegible] of Egypt to know how frequently the two opposite walls of the same chamber are not of equal length".

[illegible]
(? th century), these were made of iron.

For working wood, they used the saw, adze, axe, chisel and gimlet. They drilled holes by the end of the [illegible], and drilled it by means of a bow drill [illegible] to [illegible] of wood; they shaped it by striking with the point and the pointed hammer and by notches cut with the chisel; final- [illegible]

The working of quarries was undertaken according to circumstances, under the open sky or by means of galleries, whose ceilings were supported by posts left in the mass. Blocks [illegible] were detached by cutting grooves, then driving bronze wedges [illegible]

accuracy,-- it was still influenced by that "sagacity"that a antiquity honored in Egypt, which made it skilful in avoiding difficulties.

III. Technical Conditions.

In truth the preeminent quality of the builders in ancient Egypt was an admirable ingenuity, fertile in practical expedients. Those men that astonish us by the colossal proportions of so many of their buildings, by the number and extent of their excavations, by the perfection of their work of the stonecutters, by the enormous magnitude of the blocks so frequently handled, done with rudimentary tools and ignorant of the more primitive of our machines.

The drawing of an ellipse done in ink on a plastered rock wall belonging to the Tomb of Ramses VI at Biban el Molouk ((12 th century B.C.) shows, that they knew how to trace full sized sketches of their outlines. But they did not proceed by learned calculations, and did not embarras themselves by exactness in the measurements. "It is necessary", Mariette writes,"to have measured with measure in hand the tembles and tombs of Egypt to know how frequently the two opposite walls of the same chamber are not of equal length".

From the time of the I dynasty, the Egyptians possessed copper tools; but they long continued the use of masses of stone. After the XII dynasty (beginning of the second millenium), t they made their tools of bronze, and from the Saitic epoch (7 th century), these were made of iron.

For working wood, they used the axe, adze, saw, chisel and gimlet. They divided stone by the aid of the saw with sand, and drilled it by means of a bow drill imparting rotation to grains of sand; they shaped it by striking with the point and the pointed hammer and by notches cut with the chisel; finally they polished it by rubbing with pebbles, sand and sandstone.

The working of quarries was carriedon according to circumstances, under the open sky or by means of galleries, whose c ceilings were supported by piers left in the mass. Blocks w were detached by cutting grooves, then driving bronze wedges in them, or wooden wedges were caused to swell by wetting them.

Transportation to the site was accomplished by water as mu-
ch as possible, the great monoliths and obelisks being suspen-
ded between two boats and doubtless submerged, to reduce the-
31 ir weight. On land were employed sledges, sometimes dragged
by teams of oxen or men, sometimes pushed by the force of le-
vers, on a track previously smoothed and watered (15). If a
difference of level existed, it was compensated by the const-
ruction of an inclined plane. At Gizeh may still be recogni-
zed the one, that served to supply the yards of the great py-
ramids, and which is mentioned in the story of Herodotus, as
a kind of causeway of polished stones 3034.8 ft. long and 62.3
ft. wide.

The institution of the levy was a necessary condition for
such works of approach and equally favored the application of
a method of construction imposed on Egyptian architects by t
the scarcity of wood, and which further yielded important
practical advantages. In nearly every case all wooden scaff-
olds were avoided. For an isolated wall, they profited by t
the advantage of bricks or stones set in transverse rows to
raise a stairway at one end; in this manner under the best
conditions the working place was supplied on the backs of men.
The need supplied, the vacancy was quickly filled.[1] (16, I;37).
If an edifice were undertaken, as the walls and columns were
carried up, the spaces were filled with earth, which support-
ed the surfaces already leveled or a pavement of bricks; by
this means the workmen were furnished with an extended and f
firm platform at all stages of their work.

*Note 1. The expedient was constantly utilized for the erec-
tion of pyramids, which according to Herodotus "were first b
built in form of a stairway with steps or ledges".*

Access to these terraces was assured by ramps and whenever
the horizontal length was insufficient, by groups of stairwa-
ys, some examples of which remain on the faces of the unfini-
shed pylons of the great Temple of Amon at Karnak (16,11). T
32 The steps of each were formed by the erection of two buttres-
ses in unburnt bricks, stayed apart and held together by woo-
den timbers, the spaces being filled with tamped earth, prod-
ucing a sort of series of steps, each about five feet high.
The bricks and stones were raised from step to step, the for-

[illegible]

for lifting monoliths without scaffolding, and [illegible], have [illegible] been tried with entire success by M. Legrain, the skilful [illegible]-[illegible] of the [illegible] of Karnak. [illegible]

[illegible]

[illegible]. The [illegible] were raised to the level of the higher steps by alternately raising levers and wedging up, then slid on the top by the aid of rollers, finally raised once more and so continuing. For the second the raising was far more rapid by the use of apparatus as simple as ingenious, that M. Legrain discovered and reduced to use, and which M. Choisy, from whom we borrow the illustration, has termed the 'rocking [illegible]

[illegible] by [illegible], on which is placed the stone.(17). If one end be pressed down, the other rises; if a wedge be slipped under it, it rises and is balanced on that. Then by [illegible] a platform [illegible] of the level of the wedge and the operation is repeated. There is gained each time the thickness of the wedge; this is repeated until the height of the upper step is attained, [illegible] the process again and so con-

[illegible]

[illegible] of the force of a man, [illegible]

[illegible]

[illegible] loaded with 1 1/2 tons sufficed a force equivalent to 4.1 lbs. (0.22 ton). 2

[illegible] These [illegible]

[illegible]

[illegible] surfaces. The [illegible] preserve numerous examples of them.

[illegible]

[illegible] raised on the [illegible] the [illegible] by the aid of [illegible]

[illegible]

[illegible] there was not a single machine that could be really mo- [illegible] Vol. II.

The working of the colossal masses in which the Egyptians

[illegible]

former by slaves, the latter being raised by machines, which Herodotus mentions without explaining, and which have just b been tried with entire success by M. Legrain, the skilful restorer of the Temple of Karnak. They were of two kinds, according to whether it concerned great monoliths or stones of average dimensions. The former were raised to the level of the higher steps by alternately using levers and wedging up, then slid on the top by the aid of rollers, finally raised anew a and so continuing. For the second the raising was far more rapid by the use of apparatus as simple as ingenious, that M. Legrain discovered and restored to use, and which M. Choisy, from whom we borrow the illustration, has termed the "rocking lift".[1] This is a wooden rocker, made of two segmental sides strengthened by cross bars, on which is placed the stone.(17). If one end be pressed down, the other rises; if a wedge be s slipped under it, it rises and is balanced on that. When by blocks a platform is made at the level of the wedge and the operation is repeated, there is gained each time the thickness of the wedge; this is repeated until the height of the upper step is attained, on which one proceeded again and so continued. Rocking is done without difficulty by the work of a lever moved by the force of a man, or more practically by suspending him at its end. At need, several slaves could join their weights or pulls. Practically to elevate the apparatus loaded with 1 1/2 tons sufficed a force equivalent to 441 lbs. (0.22 ton). [2]

Note 1. These rockers commonly appear among the number of objects, that the Egyptians placed in the foundations of their edifices. The museums preserve numerous examples of them.

Note 2. Suddenly this formerly obscure passage of Herodotus became clear relating to the construction of the great pyramid- - "they raised on the first step the stones by the aid of machines m made of short pieces of wood. They were raised from the first to the second step by means of another machine, and this continued; for there were as many machines as steps, or perhaps there was but a single machine, that could be readily moved from step to step". Book II.

The setting of the colossal masses in which the Egyptians delighted, of obelisks or architraves like those of Karnak,

which weigh more than 44 tons, was no less remarkable. Interpreting the arrangements presented by the monuments, M. Choisy has given a luminous explanation. On the upper surface of the base were hollowed grooves or recesses. In them were placed intestines or sacks filled with sand, having a capacity less than the cavity, yet sufficient to cause the sack to project above the surface of the bed. The stone being once correctly placed, it sufficed to pierce the sack in order to cause a slow and safe descent of the block; when compressed, the sand ran into the recesses, afterwards being covered and invisible.

In their architectural undertakings, the Egyptians made extensive application of the principle of the division of labor. They divided the work among the numerous yards, to which enough independence was accorded, so that some portions of an e edifice reveals different procedures in execution, according to the sections. To excavate a tomb, they arranged several faces of attack above each other; at the Tomb of Ramses III, no less than four can be counted. In its turn each gang subdivided the work among a squad of trained workmen, who carried it on, a section of artisans following it and a numerous body of laborers, who served both.

In brief, Egyptian methods exhibit a great expenditure of ingenuity, a lavish employment of intelligent efforts, and a very strict discipline of labor.

Chapter 3. Programmes and their Realization.

I. Domestic Programmes.

The House.

Considered in its essential features, the arrangement of t the Egyptian house is equally appropriate to the purpose, the climate and the customs. Indeed it favored at the same time the securing of coolness, shade and ventilation desirable beneath the sky of Egypt, as well as the twofold isolation required by the oriental; that of the house from the exterior a and that of the domestic apartments from the reception rooms, or otherwise that of the harem from the living rooms.(19,40).

Aristocratic or citizen's, urban or rural, an Egyptian habitation averted itself from the exterior, since it was screened by a high enclosing wall, sometimes with battlements, or by a blind gable at most pierced by a few openings, small and located very high. Yet the doorway was always carefully treated, sometimes in the form of a pylon, or it was preceded by a columnar porch.

The plan of the dwelling of a citizen of the middle class comprised a court, larger or smaller, sometimes enclosed by a portico, around which were arranged the dwelling, offices and storerooms.

In a rural villa or the mansion of a rich man, there is a more marked separation between the offices and the house proper.(19,7; 20). Its elevation comprised a ground story, generally raised, commonly with one or two upper stories and frequently an open gallery with a terrace with light roof, or w with small structures, divided into two apartments, one for daily life and receptions. The second was first located and in its turn was subdivided into a summer salon and into a r room with the twofold purpose of winter salon and dining room; the first consisted of a portico exposed to the north; the o other adjoined and received light from it, unless this entered directly from the sky through an opening at the centre of the ceiling; it was large and its roof was generally supported by columns. As for the domestic portion, this comprised in the rear and in the second story groups of small and dark chambers, those for sleeping being provided with a sort of alcove with elevated floor.

There was considerable luxury and but mediocre comfort; at least least the sole precaution against the bad effects of h heat was the construction of thick walls; the reduction of t the number and the dimensions of windows and their partial c closing by sashes and shutters; the covering of the house by an isolating layer of earth, also affording the enjoyment on a terrace, accessible by an external stairway, of the mildness of the evenings and the coolness of the nights. Besides as soon as they had the means, the Egyptians never failed to secure the pleasure of a garden with numerous alleys of palms, fig trees, acacias, vast basins animated by water birds, and with kiosks of open structure, a sort of canopies set on slender colonnades.(20).

The Palace.

A royal palace was distinguished from that of a noble or of a rich man only by more ample proportions, a stronger enclosure, and a more complete differentiation of the different parts. Around that of Amenophis IV at Tell el Amarna extended a double wall separated by an outer road with a width of 6.6 to 9.8 ft; a covered hall measured 1022.6 sq. ft.; the harem formed an independent dwelling.(19, 6).

Moreover, the necessity for lodging a court, officials and servants equally numerous, and to store enormous receipts or tithes in kind, introduced the need of lodgings and storehouses in connection; the appendages of the Ramesseum will give an idea of the latter.

II. Military Programmes.

Egyptian architecture did not show itself expert in fortification. Doubtless at a time when defense was very superior to attack without machines, and with walls 32.8 to 82.0 ft. high and crowned by a continuous platform with a battlement parapet, this constituted a nearly impassable obstruction. But against the peril of forcing the gates and that of undermining the walls -- the second being particularly feared on account of the construction in unbarnt bricks, and the impossibility of shooting without exposing the body, when an adversary had reached the foot of the rampart -- only insufficient palliatives were invented. The arrangement of a guarded entrance employed at the fort called Shounet es Zebib at Abydos

at that of Kom el Ahmar, illustrated sufficiently by sketches 3, 4, 5 and 6 of Fig. 21, was an ingenious and practical artifice, but it obstructed the passage too much to be employed at the gates of cities, which indeed remained without defense.

As for undermining, at first could only be opposed the thickness of the ramparts, sometimes amounting to 39.4 ft., the space between them and a front wall of half the height and thinner than the main wall, and finally, the downward shooting of defenders placed on wooden balconies projecting from t the walls at regular distances.(21, 5, 6). About the epoch of the XII dynasty appeared at Semneh, Kourneh and Kom-Ombo the trench, excavated for a width of 98.4 to 131.2 ft. with a very rudimentary sketch of the only system for effectively defending the base of a wall, that of flanking it by buttresses or bastions.(21, 1, 2, 3, 4).

III. Funerary Programmes.

We have already noted, that the future life, as conceived in Egypt, strictly depended on the permanence of the condition of the present one, on the one hand on the duration of the corpse, embalmed for that reason, or at least on the existince of an image of the deceased, and on the other on the possession of provisions, furniture, articles of luxury or utility relating to the general needs of man and to the particular rank of the departed. Then in Egypt the programme of the tomb was quite analagous to that of the dwelling, and comprised the erection of a true habitation arranged in two parts; a p private chamber for the mummy and the images of the deceased, and a room for dining, work or recreation, where finally might be received the visits and offerings of the living; in brief, a cave and a "chapel". Architecture fulfilled these in a remarkable fashion at the end of an evolution extending under the three first dynasties. Its formulas varied according to whether it operated in lower or upper Egypt, and on account of a private man or for a sovereign.

The Mastaba.

In its rudimentary form the Egyptian tomb was reduced to a pit, at first circular, later oval and finally rectangular, in which are found interred together the corpse and its equipment.

The twofold desire to ensure the preservation of both and to conform the "dwelling for eternity" to the image of the terrestrial was the incentive for an evolution, whose greater stages will be noted.(22).

A first advance substituted for the arrangement of a filled pit that of a chamber kept empty by enclosing walls and a covering.(3, 4).

It was a second when bymeans of a wattled partition and later by a wall, a separation was made between the chamber for the dead and one or more cells for its provisions, attached at one end of the sepulchral chamber, at both ends or at the four sides.(7, 8, 9). The volume formed by the whole might m measure from 53 to 19055 cu. ft. (Tomb of Qua at Abydos), the chamber in great tombs, like that of Men at Negadeh or of Qua at Abydos, occupying areas respectively of 452 and 1399 sq. ft., with a height to the ceiling of 3.3 to 8.2 ft. The tomb was exceptionally above ground in the form of a rectangular structure with blind faces and crowned by a terrace -- what Egyptology terms a mastaba.[1] The normal arrangement extends over a sunken structure -- the chamber and the cells -- whose ceiling is level with the ground, its floor from 3.3 to 13.2 feet beneath it, with a superstructure or mastaba in the shape of an oblong truncated pyramid projecting largely beyond the tomb, and composed of a filling of sand or earth retained by the walls.

Note 1. The Arab name for the divan constructed by orientals.

Toward the end of the I dynasty, the approximation of the tomb to the house was much advanced by opening at one side of the lower structure a doorway, accessible by a stairway and closed by a stone portcullis sliding in grooves in the jambs. (11, 12, 13). It was carried further by the architecture of the II dynasty, which ensured a communication between the chamber and the different cells by arranging around the former a passage into which the cells opened.(14).

Yet the tombs of the epoch of the III dynasty at Bet Khallaf, Requaqunah and Gizeh exhibit considerable progress in the sense of an accurate adaptation of the tomb to its purpose. On the one hand the safety of the corpse and its equipment w was increased by the precaution of excavating the chambers in

the depths of the earth, even to more than 75 ft. below the surface, the means of access consisting of stairways, corridors or wells concealed at the terrace and carefully obstructed by sliding blocks of stone and sand filling. [1] (23). On the other hand the fulfilment of sepulchral worship was facalitated, at the same time that the resemblance of the dwelling of the dead to that of the living became distinct, by two suc-
42 cessive innovations; a first one added to the eastern facade of the superstructure a representation of an entrance; a second made of this "false doorway" a real one, affording passage to an oblong hall parallel to the facade, with a "false doorway" on its western wall; then the deceased had his reception hall, open to the pious visits of the living, bearing o offerings. Completing the approximation of the tomb to the house, a front wall was parallel to the eastern side of the mastaba, enclosing a court.(24, 1, 2, 3).

Note 1. At the Tomb of Neter Khet at Bet Khallaf, the mastaba measures 278.9 % 146.7 ft. with a height of 26.3 ft.: t the sepulchral chamber is 16.4 ft. square and 9.8 ft. high, 88.6 ft. below the summit of the mastaba and 52.5 ft. below the surface of the ground. The largest of the sliding blocks of stone is 16.4 ft. high, 9.8 ft. wide and 2.0 ft. thick.

The substitution of stone for bricks, the exclusive choice of the well as the means of access to the lower structure, a and the arrangement of a true dwelling in the mass of the su-
43 perstructure distinguish the mastaba of the III dynasty, unknown till very recent times, that of the ancient empire, better known and preserved.(24, 4 - 7). The part beneath the open sky remained a terrace of rectangular plan and variable d dimensions;[1] the principal axis being more or less carefully orientated from north to south. Four times in five, the facade is at the east; if not, it is turned toward the north.

Note 1. One measures 26.3 % 19.7 ft., another 173.9 % 85.8 ft.

The internal arrangement substantially comprises a "chapel" and a "serdab"above ground with a vault underground. The western wall of the first was always provided with a "false" doorway, before which was found a "table of offerings". As for the serdab, reduced in width and height and generally placed

[illegible] and sometimes on the north, but [illegible] the [illegible] of the dead [illegible], it [illegible] the images of the deceased, and frequently in order to permit them to smell the odor of food and perfumes, it communicated with the chap-el by small openings. For a dead person of distinction the [illegible] was succeeded by a porch, one or more vestibules, and [illegible] halls with [illegible] closets [illegible] for provisions. There might even be several [illegible] chapels, one reserved for the deceased man, another for his wife and a third for his son. Paintings on the walls represented the occupations and [illegible]

[illegible]

ut 4 [illegible], but which frequently extended to 10.5 or even 52.4 ft. [illegible] by a [illegible] at the [illegible] a [illegible] of square section, whose [illegible] (24, 2).

The [illegible]

[illegible] the development of the [illegible] the funerary architects of the III dynasty derived the [illegible] of the [illegible] from a very slightly different con-[illegible] of the same [illegible].

[illegible] and [illegible]. At the [illegible]

[illegible] toward the sky and [illegible] of enormous dimensions.[1] The [illegible] an actual building adjoining the eastern face of the monu-ment and divided into vestibules, halls and [illegible].[2]

[illegible]

at the south and sometimes on the north, but rarely at the west of the room first mentioned, it contained the images of the deceased, and frequently in order to permit them to smell the odor of food and perfumes, it communicated with the chapel by small openings. For a dead person of distinction the entrance was succeeded by a porch, one or more vestibules, and columnar halls with the closets reserved for provisions. There might even be several complete suites, one reserved for the deceased man, another for his wife and a third for his s son. Paintings on the walls represented the occupations and the earthly recreations of the dead, his properties and his dignities. The dimensions varied greatly; the double of Ti had at Saccara a chapel 23.6 ft. long, 22.6 ft. wide, and a columnar hall measuring nearly 1830 sq. ft. (24, 5, 7).

The chamber for the sarcophagus was excavated in the southern part of the underground portion to a depth averaging about 40 ft., but which frequently extended to 66.6 or even 98.4 ft. It was accessible by a low corridor opening at the bottom of a large well of square section, whose upper end was in the terrance of the mastaba. (24, 6).

The Pyramid.

At the same time as the development of the type of the mastaba, the funerary architecture of the III dynasty derived the formula of the pyramid from a very slightly different application of the same principle.(25;9u6

This comprised a superstructure and a substructure. At the centre of a square area enclosed by a wall, with a gateway at the middle of the eastern side and facing an avenue, rose a solid structure conceived in the style of a mastaba and similarly orientated, but early placed on a square plan, pointing toward the sky and capable of enormous dimensions. [1] The chapel was separately placed as a kind of small structure, really an actual building adjoining the eastern face of the monument and divided into vestibule, halls and courts. [2]

Note 2. Pyramid of Zozer at Saccara; rectangular base of 393.9 x 352.0 ft.; height 213.7 ft. Pyramid of Mycerinus; base 354.3 ft. square, height 280.2 ft. Pyramid of Chephren; base 707.7 ft. square, height 454.2 ft. Pyramid of Cheops;

[illegible]

[illegible]

Note 3. That of the Pyramid of Snefru at [illegible] measures [illegible]

[illegible]

[illegible]

[illegible] is composed of a passage [illegible] a group of cells connected by a court, the whole occupying a nearly square area of more than 32,750 sq. ft.; that of the Pyramid of Unas at Saccara form- [illegible]

[illegible]

an attempt, excavated in the rock to a depth of [illegible] or less [illegible]. with a system of corridors and of cells accessible by a gallery concealed at the surface of the ground or opening on the face of the pyramid and barricaded by stone blocks. Complexities and complications such as branching passages, blind passages, placing of chambers at different levels, even in [illegible]

[illegible]

[illegible]

the violators of tombs.

[illegible]

[illegible] in its centre exists a rectangular chamber, [illegible] the [illegible] and measuring [illegible] x 27.0 ft. and 11.1 ft. high. It is accessible by a narrow and low passage (3.6 ft. wide and 3.5 ft. high), that opens on the north face of the pyra- [illegible] it descends for a length of nearly 328.1 ft., then continues as a landing for 20.4 ft. The sepulchre was [illegible]

to be [illegible]. Its purpose was limited to a chamber -- to which was given the name of the "queen's chamber" -- arranged in the axis of the monument, a little north of the vertical and at about 3[illegible].0 ft. above the level of the ground; its di-

[illegible]

[illegible]

[illegible]

base 764.5 ft. square, height 480.7 ft., volume more than 88, 267, 500 cu. ft.

Note 2. That of the Pyramed of Snofrou at Meidoum measures externally 29.5 ft. and comprises two parts, a court with an altar for offerings between two steles, together with vestibule and sanctuary; that of the Pyramid of Mycerinus at Gizeh is composed of a vestibule and a group of halls opening on a court, the whole covering a nearly square area of more than 32,290 sq. ft.; that of the Pyramid of Ounas at Saccara forming a relatively important group of porticos, courts and halls.

The properly sepulchral portion was formed of a chamber or an apartment, excavated in the rock to a depth more or less great, with a system of corridors and of cells accessible by a gallery concealed at the surface of the ground or opening on a face of the pyramid and barricaded by stone blocks. Complexities and peculiarities such as branching passages, blind passages, repetition of chambers at different levels, even in the solid rock beneath the surface of the ground -- as at the Great Pyramid, -- resulting either from modifications in the plans because of enlargement, or from the desire to decive the violators of tombs. [1]

Note 1. The Pyramid of Cheops is typical in that respect. (25, 43). At nearly 101.7 ft. beneath its base and almost under its centre exists a rectangular chamber, orientated like the edifice and measuring 45.9 x 27.0 ft. and 11.4 ft. high. It is accessible by a narrow and low gallery (4.0 ft. wide a and 3.5 ft. high), that opens on the north face of the pyramid at 49.2 ft. above the ground, and is closed by a block moving on a pivot; it descends for a length of nearly 223.1 ft., then continues as a landing for 20.4 ft. The sepulchre was unfinished, when an extension of the primitive plan caused it to be abandoned. Its purpose was changed to a chamber -- to which was given the name of the "queen's chamber" -- arranged in the mass of the monument, a little north of the vertical axis at about 65.6 ft. above the level of the ground; its dimensions are 18.7 x 17.0 ft. and 20.2 ft. high; it is reached by the gallery previously mentioned, then by a corridor branching from its ceiling, first ascending for a length of 108.3

[illegible]

ed the creation of a new chamber, located a little over 131.5 ft. below the ... of the ..., a small ... is ... a chamber 10.1 ft. high, 17.1 ft. long from north to south and 2?.? ft. from east to west; there is still found the sarcophagus of the ... It is reached by a gallery continuing the descending portion of the preceding one, and which is 117.? ft. long, 3.13 ft. wide and 27.9 ft. high.

The tomb in Upper Egypt. — The ... — The ... in ... Egypt.

Let the ... of the ... and ... were not applicable in Upper Egypt. ... were accessible with difficulty, with ravines at their summits, the ... ranges did not lend themselves to the establishment of ..., like the ... on the west of the lower Nile. Therefore being compelled to place the dead in tombs ... together in the ... at the foot of the ... by the inundation, or in artificial grottos excavated in the ... of the cliffs.

But the first solution, examples of which abound at Abydos and Thebes, on account of the ... of the soil, could not constitute a ... in ..., and it was necessary to ... a ... in all ... — ... of the ... — or

[illegible]

as ... it could not be ... in the form of a ..., the ... as ... on the ... of the "..." on the face of the small ..., preceded by a little court and small ....

The tomb in the rock.— ... — as it appears at ...

[illegible]

... the entire internal arrangement of a sepulchre in lower level, passing through a dozen more or less ..., one successively ... a square or oblong hall, sometimes ...

[illegible]

doorway"; from floor a well gives access to the sepulchral chamber. At other times the latter was not beneath, but beyond the axis of the chapel, at the end of a corridor that ... fig. (??, 1, 2).

ft., afterwards being horizontal. A third modification caused the creation of a new chamber, located a little over 137.8 ft. high and composed of two rooms, a small vestibule and a chamber 191 ft. high, 17.1 ft. long from north to south and 34.2 ft. from east to west: there is still found the sarcophagus of the Pharaoh. It is reached by a gallery continuing the ascending portion of the preceding one, and which is 147.6 ft. long, 3.42 ft. wide and 27.9 ft. high.

The Tomb in Upper Egypt. -- The Hypogeum. -- The Tomb in Lower Egypt.

Yet the allied schemes of the mastaba and of the pyramid w were not appilcable in upper Egypt. Elevated and accessible with difficulty, with ravines at their summits, the Libyan a and Arabian ranges did not lend themselves to the establishment of cemeteries, like the table lands on the west of the lower Nile. Therefore being compelled to place the dead in tombs close together on the narrow strip at the foot of the bank spared by the inundation, or in artificial grottos excavated in the sides of the hills.

But the first solution, examples of which abound at Abydos and Thebes, on account of the friable nature of the soil, could not comprise a funerary chamber excavated in the ground, and it was necessary to arrange as a sepulchre in all or a p portion -- according to the dimensions of the monument -- of the square or pyramidal mass of the superstructure (26).When, as frequently happened, it could not be placed in the form of a vestibule, the chapel was reduced to the symbol of the "false doorway"on one face of the small structures, preceded by a little court and small garden.

The type in the rock,-- subterranean -- as it appears at B Beni-Hassan, El Bershen, Thebes, Siout etc., substantially repeats the entire internal arrangement of a sepulchre in lower Egypt, passing through a porch more or less monumental, one successively enters a square or oblong hall, sometimes subterranean, then a chapel at the back of which is found the "false doorway"; from floor a well gives access to the sepulchral c hamber. At other times the latter was not beneath, but beyond the axis of the chapel, at the end of a corridor that might measure 131.2 ft. (27, 1, 2).

From the day that the capital was transferred from Memphis to Thebes, it became necessary to find for the royal dead an 47 equivalent of the pyramid, accommodated to the special geographical requirements mentioned. Also the evolution of belief determined a modification of the primitive programme.

Sepulchre and chapel were distinctly separated, often by g great distances.

The first was excavated in the Libyan hills and was composed of a long series of inclined corridors, descending stairways and of chambers, in the image of the series of corridors traversed by the sun with his train of souls during the nocturnal course of his bark through the infernal regions of Amentit. Certain caverns were in form of columnar halls, especially those in which the mummy reposed. The longitudinal extent of these tombs was considerable; [1] it frequently measured 197 to 262 ft.; it attained 410 ft. in that of Ramses III, and in the hypogeum of Seti I, it would have exceeded 475.7 ft. as measured today, had it not been interrupted by a landslide. (27, 3). To mislead robbers, precautions and deceptions were multiplied; false wells, blind passages, masked by an artificial landslide before the external opening.

Note 1. Hence the name of Syrinx given to such a tomb by the Greeks, on account of the analogy they found to the reeds of their flutes, the syrinx.

At the same time that he paepared in the heart of the hill a hiding place for his mummy, the sovereign realized the "chapel" indispensable to the funerary worship of his "double" by erecting somewhere in the plain an actual temple, similar to those of the gods in the company into which death introduced him.

None of the types just examined was suited to the alluvial lands of the delta. The one there employed placed above a h high brick base chambers in which were deposited the mummies. As for the kings of the dynasties that reigned at Tanis, Sais or Bubastis, if we believe Herodotus, a sepulchre was arranged for them in the court of a temple.

IV. Religious Programmes.

No more than a dead person, could an Egyptian deity pass f from its dwelling on the banks of the Nile; for its real pres-

presence on earth was believed, under the appearance of a statue, animal or an object consecrated to it, and therefore i 48 imbued with its personality. "House of god", "chateau of god", were in Egyptian language the significant appellations of the temple, besides being amply justified by the perfect conformity of its arrangement to the plan of a human dwelling.

49 50 While this was merely a miserable shelter and the rites remained elementary -- we know this by the representations of the primitive sanctuary given by the hieroglyphic signs -- the gods were contented with modest chapels similar to the wattled hut covered with mud or to the cabin of bricks and of wood, according to the periods, which sufficed for men; the small structure occupied the centre of a palisaded enclosure, and before its gate rose two masts.(28,1).

When the progress of civilization had produced an enlargement and subdivision of the Egyptian dwelling, the gods immediately benefited thereby.

And first the sun obtained from the piety of his sons, the Pharaohs, the homage of imposing edifices, a specimen of which we possess in the Temple of Abou-Gourab near Abousir (28, 2). On the terrace of a high artificial substructure, a rectangular court (328. × 246. ft) was bounded by a series of c chambers and storehouses. Its eastern portion near the entrance was arranged as an abattoir for the sacrifices; toward the centre it bore a massive altar 18.0 ft. long, 19.7 ft. w wide and 3.9 ft. high; finally at the west stood a truncated pyramid surmounted by an obelisk, reaching a height of about 98.4 ft., the symbol of the god.

Yet from the distant times of the Ancient empire -- on the evidence of the funerary Temples of Chephren at Gizeh (Temple of Granite or of the Sphynx) and of Neoserre at Abousir -- t there existed in its power the normal Egyptian temple, which was to raise to a climax the grand Theban period (28, 3). L 51 52 Likewise its arrangement was strictly determined by the attribution to the deity of human needs and by the requirements of a worship, both very secret and very pompous. This comprised two services, one private and the other public. The first consisted in homages and in properly domestic attentions

[illegible] to the masses [illegible] the solemn appearances of the sovereign the precinct, and on extraordinary occasions, in the interior of his chamber by the feature of his ecclesiastical authoritative. The second was constructed on festal days by an exhibition of the statue, offered for the admiration of the faithful and borne in procession. From the programme result-ing, the religious architecture of Egypt understood how to [illegible] accommodate a facility as grand as appropriate. (36, 28, 30, 33).

Before the entrance of Egyptian habitations, the "house of the god" [illegible] to the [illegible]. And first the walls of the [illegible] a vast area in the form of a rectangle. This was entered only after following a double [illegible] avenue of statues of sphinxes or of rams (34, 31).[1] and [illegible] a [illegible] in the form of a great rect-angular tower, or [illegible] in a wall between two towers, other-wise [illegible] a "pylon" (11, 32). The defensive charac-ter of the entrance, in accordance with the idea [illegible]

[illegible]

situated at the temple of Rameses III at Medinet Habou, where

[illegible]

In the midst of gardens, beautified by kiosks and water [illegible]-[illegible] and [illegible] extended, rose the divine palace. [illegible] the seclusion was [illegible]

[illegible]

practically with reference to the course of the Nile, regard-ed as flowing necessarily from south to north, these were fil-ed -- the two longer and one of the shorter sides; the fourth opposing to the visitor has its aspect of severity of a lofty [illegible]-on,[5] as the [illegible] of a portal relatively low and

[illegible]

like colossal statues as guards, and against the [illegible] rise-

[illegible]

rendered to the master daily in his private apartments by his servants the priests, and on extraordinary occasions, in the interior of his chamber by the Pharoah or his ecclesiastical subordinate. The second was contributed on festal days by an exhibition of the shrine, offered for the admiration of the faithful and borne in procession. Frim the programme resulting, the religious architecture of Egypt understood how to i introduce a reality as grand as appropriate. (28, 29, 30, 33).

After the manner of Egyptian habitations, the "house of the god" turned its back to the exterior. And first the walls 40 ft. high isolated a vast area in the form of a rectangle. T This was entered only after following a longer or shorter time an avenue of statues of sphynxes or of rams (11, 31),[1] and passing through a gateway opened in the mass of a great rectangular tower, or rather in a wall between two towers, otherwise said to be in a "pylon" (11, 32). The defensive character of the entrance, in accordance with the idea included in the before mentioned name of "chateau of god", is notably emphasized at the Temple of Ramses III at Medinet Habou, where it is formed by a little castle in the manner of Syria, commemorating the campaigns of the prince in that country (100). In the midst of gardens, beautified by kiosks and water basins and where a sacred lake extended, rose the divine palace. As much as that of the sacred area, its seclusion was absolute. Of its four facades arranged on the sides of a rectangle [2] and theoretically orientated according to the cardinal points, practically with reference to the course of the Nile, regarded as flowing accurately from south to north, three were blind -- the two lonber and one of the shorter sides; the fourth opposing to the visitor the majestic severity of a lofty pylon. [3] as the jealous guardian of a portal relatively low and narrow. Before it rose as enseigns two obelisks; frequently also colossal statues as guards, and against the facade itself were high masts bearing streamers and retained by wooden timbers projecting from slots.(32, 12, 13).

Note 1. At Karnak the principal avenue connecting the Temple of Amon with Luxor measured 1.25 miles with a width of 75.5 ft., the intervals between the sphynxes averaging 13.1 ft.

Note 2. Here are some dimensions; Temple of Amon at Karnak, 1200 x 328 to 377 ft.; Temple of Luxor, 858 by 121 to 206 ft.; the Ramesseum, 525 by 164 ft.; Temple of Medinet-Habou, 492 by 157.5 ft.; Temple of Khons at Karnak, 243 by 91.8 ft.

Note 3. That of the Temple of Amon at Karnak measured 370 ft. in length and 142.5 ft. in height.

Having passed the doorway, one finds himself in a vast court [1] bordered sometimes on the sides only, sometimes on the front also, by porticos generally single but sometimes doubled, as the case at the Temple of Khons and the Ramesseum (51, 54, 65); an altar occupies the centre. At the rear and at a level above that of the court occurs a vestibule accessible by a ramp or a flight of steps; at first this was merely a portico of greater or lesser depth; in the Ptolemaic epoch, it became an actual hall enclosed in front by the wall at half the height of the front intercolumniations, examples of which are presented by the Temples of Edfou, Denderah and Kom Ombo. (30, 1, 2; 43, 44, 66).

Note 1. At the Temple of Amon at Karnak, the great court measures 276 ft. in depth for a width of 338 ft. At the Temple of Luxor, the corresponding dimensions were for the first court 187 by 167 ft., and for the second court 148 by 167 ft.; at the Temple of Medinet-Habou, 125.5 by 138. ft.

From the vestibule through an opening in its rear wall, one entered a great nave, dimly lighted, its ceiling supported by a quincunx of columns. That of the Temple of Amon at Karnak is the most complete realization and occupies an area of ~~53~~, 53,822 sq. ft., being 170.6 ft. deep by 338 ft. wide, and it raises to 75.5 ft. the ceiling of its three central aisles,[1] and to 42.7 ft. those of the side aisles.(29, 3; 31). The p. purpose of this columnar hall was sufficiently defined by the names of "broad hall", "assembly hall" and "hall of the apparition", given to it by the Egyptians. It was properly the throne hall of this divine palace, into which on festal days crowded the faithful, to adore the god after leaving his apartments in his boat on the shoulders of the priests.(44). At the middle extended on the general axis of the edifice an aisle wider and higher than the others, leading to a doorway a

almost always closed, the access to the "mysterious and occult halls", otherwise termed the private habitation of the deity. This dwelling comprised two parts; at the centre being the holy of holies or hall of the boat, a rectangular room, narrow and deep, the lodging of the divine image, which was sheltered in a shrine placed on a boat; on each side were cells for use as sacristies, treasuries and storerooms.

Note 1. Olympeion of Akragas, 67,788 sq. ft.; Cologne Cathedral, 66,346 sq. ft.; S. Peter's Church in Rome, 163,122 sq. ft.

Excepting in the vicinity of the doorways, light was scarce, sparingly filtered through small openings made at the junction of the walls and ceiling, or narrow slits made in the roof; in the central aisle of the columnar hall, it was sifted through stone open work, that filled the space between the covering of the side aisles and that of the higher nave.(42,2).

Note 1. These screens were stone slabs pierced by slots, whose width does not exceed 10 ins.

In the Egyptian fashion, the master of a divine mansion utilized its terraced roofs; easily accessible by straight or winding stairs, these supported shrines -- equivalents of the porticos and pavilions placed on the roofs of the dwellings of men -- and even oratories like that, which on the lower t terrace of the Temple of Denderah contained a quincunx of 12 columns.

Finally numerous and important, in accordance with the dignity of the lord of the place, outbuildings gathered around the "palace"; lodgings for the priests and servants, granaries, cellars and stables, characteristic examples of which have been preserved to us by the Ramesseum.

Such was the formula of the Egyptian temple in its essential traits. It is found again in the variations caused by a complication of the plan here, there an extension or reduction of proportions, elsewhere an adaptation to particular topographical conditions.

That is, at first differences due to additions. If a temple was common to a triad of the god, his wife and their son, or to a group of several deities, the holy of holies was divided

used as well as in the [illegible]. The side cham-
bers at Kom Ombo, [illegible] in the temple of [illegible], [illegible] at Abydos. In both cases the sanctua- [illegible]
[illegible] were formed in the wall of the vestibule; at Kom Ombo, [illegible]

Sanctuaries. -- Sanctuaries are seen in the temple of Seti I at Kurneh and at Abydos -- [illegible] a distinct [illegible] and [illegible] by little doors.

The scheme of the [illegible] introduces a modification in the arrangement of the sanctuary, of which the temple of [illegible] presents an example, and which the Ptolemaic temples employed, not only in [illegible] but also in several of the [illegible] ones.[1] It emphasizes the secrecy of the holy of holies by making that a cell entirely isolated in the centre of the sanctuary by a corridor connecting with its surrounding rooms.[2] (Fig. 56, 57).

Note 1. [illegible]

Note 2. See page 41 and fig. 36, 37, an analogous disposition [illegible].

[illegible] the temple of [illegible] of Seti [illegible] [illegible] [illegible]

[illegible] was easier than the [illegible] of a [illegible] of [illegible] 200. [illegible] of a sovereign [illegible] made at [illegible] by [illegible] temples, which was [illegible] [illegible] it [illegible] court [illegible] [illegible] [illegible] court [illegible]. To [illegible] several [illegible] owe their [illegible] the com- [illegible]

[illegible] to the [illegible] orders.

into as many cells as it possessed inhabitants. Two are counted at Kom Ombo, three in the Temple of Khons at Karnak, and seven in that of Seti I at Abydos. In this case the subdivision also affected the state apartments; at Kourna three doorways were formed in the wall of the vestibule; at Kom Ombo, everything was doubled from the pylon. (33).

Sometimes, -- examples are seen at the Temple of Seti I at Kournah and at Abydos -- besides a sleeping chamber and closets, the domestic lodging comprised a small columnar hall flanked by little rooms.

56 The epoch of the XX dynasty introduced a complication in the arrangement of the sanctuary, of which the Temple of Khons presents an example, and that the Ptolemaic period employed, not only in its own edifices but also in several of the preceding epoch. [1] It emphasized the secrecy of the holy of holies by making that a cell entirely isolated in the centre of the sanctuary by a corridor connecting with its subordinate rooms. [2] (28, 5; 30).

Note 1. See Temples of Amon at Luxor and Karnak.

Note 2. See page 41 and Fig. 22, 14, an analagous development in the plan of the tomb.

As peculiarities of arrangement may still be cited -- notably at the Temple of Deir el Bahari and in that of Dendera -- the existence of little courts enclosing an altar or a kiosk, and that a specimen presented by Dendera, of crypts in the f form of galleries in stories beneath the ground in the thickness of the walls, and accessible by stairways or by trap doors placed in the pavement. (30, 3).

Nothing was easier than the amplification of a palace of t the god. Like that of a sovereignit made an impression by t the portion intended for display, which was always susceptible of enlargement. It sufficied to set columns in the court and to cover it, in order to double the columnar hall, repla-
57 ced by restoring the suppressed court before the original facade. To that operation repeated several times, the great Temples of Luxor and of Karnak owe their length and the complexity characterizing them.

Inversely, without ceasing to fulfil the programme, the temple might be reduced to the proportions of a modest oratory.

Thus at Deir el Medine that of Hathor, whose length does not exceed 164 ft., successively offers within the portal a miniature of the columnar hall on two detached supports; separated from them by two columns connected to the walls by a high parapet is a raised vestibule; finally a sanctuary composed of a holy of holies, a treasury and a sacristy. (28, 4; 66).

Finally, if a rise of the ground became an obstacle to the development of the normal plan, the Egyptian architect did not hesitate to substitute for the ordinary arrangement a landing, one in steps, just entirely as if it concerned a funerary dwelling, to bury part or all of the edifice in the slopes of a mountain. So in Nubia, the solution was imposed by the form of the valley, closely hemmed in by the riverside h hills.

As examples of temples half subterranean (hemispeos) may be cited at Deir el Bahari the funerary Temple of Thoutmosis III and of Hatshepsouet, and the "House of Ptah" at Gerf Houssain. (36, 1, 2, 3). The first of these monuments was almost entirely under the open sky; its lower terrace formed a square, the middle terrace was a court; the landing crowned by the p porticos of Pount and of the Birth were the vestibule; the upper platform, formerly bearing columns and covered, was the columnar hall; the sanctuary alone was enclosed within the r rock. At Gerf Houssein a square of 45.0 ft. was likewise subterranean, and the court enclosed by porticos was alone a structural work.

As for the subterranean temple (speos), the Great Temple of Ipsamboul presents a model realization. Nothing is wanting in the canonical arrangement; a terrace cut in the rock simulates the square; the surface of the rock is cut in the form of a pylon with a portal; passing this one finds himself in a hall 58 ft. deep and 54 ft. wide, whose eight pillars were reserved in excavating, and it forms a court with porticos; there is a columnar hall with four columns and measuring 24.6 × 36.1 ft.; finally a sanctuary is accessible with three doorways, and it has three sacred chambers for Amon, Ptah and Harakte; treasuries and storerooms flank the whole, which from the threshold to the rear measures no less than 180.5 ft.(36, 4; 35, 13).

As he arranged for himself the dwelling for his worshippers, the Egyptian god adapted for himself their summer shelter, t the kiosk. From this indeed was derived the temple termed peripteral, a small structure,[1] specimens of which are known to us from the XVIII dynasty (28, 7; 14; 34). At the middle of a rectangular platform on a substructure of moderate height, accessible at one of its ends by a flight of steps, stood a narrow sanctuary around which extended an open gallery on piers or columns; in the Ptolemaic period the lower portion of the intervals was closed by a parapet. The sacred enclosure represented the court, while the surrounding portico took the place of the vestibule and columnar hall. Sometimes the lodging of the god was reduced to one chamber, as at the little Temple of Amenophis III on Elephantine; sometimes it was disposed in several halls in a series, as at the Chapel of t the Birth adjoining the Temple of Isis on the island of Philae; occasionally, as at the peripteral structure of Thoutmosis III at Medinet-Habou, it was completed by outbuildings at the rear.

Note 1. At the little Temple of Elephantine, the sanctuary measures 39.4 by 31.1 ft., and the platform is 7.4 ft. above the ground.

[illegible]

[illegible] Construction

[illegible] a [illegible] of [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] of [illegible] are of [illegible], [illegible] [illegible] [illegible] [illegible] of the [illegible] [illegible] of [illegible] the [illegible]. [illegible] [illegible] the [illegible] [illegible] a [illegible] for [illegible] [illegible]

[illegible] to have [illegible], and for its [illegible] [illegible]. The [illegible] of [illegible] and mass [illegible]. [illegible] of [illegible]; and the [illegible] of [illegible] [illegible] the [illegible] by the [illegible] of [illegible], [illegible] of the [illegible] have [illegible] [illegible] of [illegible] to that of the [illegible]

[illegible]

[illegible] construction [illegible] employed [illegible] the use of [illegible], [illegible] on a [illegible] of [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] a [illegible], a [illegible], [illegible] a [illegible]

Note 1. For example, see the palace at Tell el Amarna, the [illegible] at [illegible], [illegible] etc.; the [illegible] of [illegible], the [illegible] of [illegible], of [illegible] [illegible] of [illegible] [illegible] of [illegible]. See the [illegible] [illegible], [illegible] of [illegible] and [illegible]

[illegible] The [illegible] [illegible] the [illegible] were [illegible] [illegible] [illegible] of [illegible] of [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] from [illegible] [illegible] [illegible]

Note 2. [illegible] [illegible]

60 Chapter 4. Construction.

Egyptian construction reveals a spirit of enterprise and sequence, a simplicity and ingenuity, that compel our admiration. It recoiled from no problem and many solutions proposed by it were elegant.

In spite of negligences and of irregularities, of mistakes attributable in large measure to the enormity of the demands and to a system of labor directly under the government, it p possessed to the highest degree a taste for beautiful materials, the feeling for and the means for perfect execution. It is wrong to have taxed it with timidity, and for its works to have been criticised for excess of strength and massiveness. It certainly was never economical of material; but the volumes given to the members of an edifice in general were in proportion to the work imposed thereon by the realization of the programme, and one could say of the great nave at Karnak, that "it gave evidence of boldness comparable to that of the Greeks".

I. The Materials.

Egyptian construction long employed merely the mud of the Nile, spread on a lattice-work of reeds or of palm ribs, and until the end, earth remained the preferred material, when it was required to erect a house, a palace, a fortress, a tomb, or even a temple.[1]

Note 1. For example, see the Palace at Tell el Amarna, the forts at Abydos, Semneh etc.; the mastabas of Saccara, the p pyramids of Dachour, of Licht and of Illahoun; at Karnak the chapels of Peteneit and of Sheshonk. See the Sarcophagus of Mycerinus, the model of a house of wood and crude bricks.

It utilized this mud moulded in squares and dried in the sun. The bricks from the time of the Ancient empire were rougher and mediocre, made of a mixture of mud, sand and gravel; they were rectangular and rather small.[2] Then the manufacture was perfected at the same time the size was increased.[1] Mixed with chopped straw or with the residue from threshing grain, Egyptian mud acquired in drying a durability and a remarkable consistency.(37).

Note 2. Averaging 8 3-4 to 10 1-4 ins. long, 4 3-8 to 5 1-8 ins. wide and 2 3-8 to 3 1-8 ins. thick.

Note 2. Length 14 1-4 to 15 3-8 ins., width 7 1-8 to 7 1-2 ins., thickness 4 3-8 to 4 3-4 ins.

The primitive architecture of Egyptcaused an enormous consumption of wood, native or foreign, the latter being imported from Syria; it served to cover, wainscot and floor not only houses, but also the tombs (22, 10, 12; 42, 1). Attaining m maturity, it continued to have recourse to this for the construction of those light kiosks in which the egyptians took pleasure.

Yet from the epoch of the I dynasty, Egyptian architecture had a taste for building in stone and the courage to attack granite; evidenced by the stone jambs and sills inserted in the brick walls of its temples and the slab of rose granite by which the Tomb of king Den was ornamented. With the II dynasty opens the series of stone structures, whose typical example is presented by the limestone walls of the funerary chamber of king Khasekhemui. In truth, the cutting generally betrays inexperience and particularly the inadequacy of the equipment of tools. Executed by the aid of a hammer of silica, it was reduced to the minimum as far as possible by the
42 utilization of fracture planes at the quarry. Still it tended always toward regular prisms, and the admirable work on the enormous blocks of the Tomb of Nefir Ka at Zaouyet el Aryan proves, that by application it could attain the mastery. Thenceforth it caused a prodigious consumption of stones of all sorts.

Yet Egyptian architecture always retained the economical h habit of combining different materials in the same edifice. Thus to cite some examples, at the Temple erected by Khasekhmui at Hieraconopolis, the beginning was of brick, but the jambs of the doorway were fashioned in gray granite; the mass of the Great Pyramid is in fine limestone from the Mokattam, and the chambers are in granite; as for the "Temple of Granite", rose granite was employed, but the chamber and the ascending stairway were ornamented with alabaster; at the Temple of Ramses II at Abydos, the variety is still greater; very fine limestone for the walls, black and red granite for the doorways, sandstone for the pillars and alabaster for the holy of holies.

[illegible] that the preservation of the greatest [illegible] improved processes [illegible] of the [illegible] used [illegible] [illegible] in the [illegible] of a [illegible] the [illegible] of the works.

[illegible] ft. long, [illegible] ft. high and [illegible] [illegible]. [illegible] columns were made [illegible], and those [illegible] with considerable dimensions were formed by grouping several [illegible]

[illegible] the [illegible] of the columns [illegible] [illegible], they [illegible] of the beams set [illegible] [illegible].

It is no less true that the Egyptians had a weakness for great blocks. In the time of the IV dynasty, there were [illegible] the Tomb of [illegible] at Zawiyet el Aryan slabs of granite of more than 358 cu. ft. [illegible] the epoch of the great [illegible] [illegible] quarried in the same material blocks [illegible] to [illegible] ft. long and [illegible] to [illegible] ft. wide. There exists and [illegible] the Tomb of [illegible] the shaft of a column [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] of the colossal [illegible] of [illegible] [illegible] [illegible] ft. wide and [illegible] [illegible], and their weight [illegible] estimated at 100.2 cu. ft. and [illegible] weight at [illegible] [illegible] great [illegible] of the same Temple, [illegible] contains a lintel of [illegible] ft. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and [illegible] of [illegible] transported from Assuan to [illegible] and [illegible] without accident [illegible] reaches 105 ft. long! [1]

[illegible]

[illegible] erected in the Temple of Karnak, and which is still [illegible] [illegible], measures 105.7 ft. with a side of [illegible] ft. at the [illegible]

[illegible]

It is however a fact, that the construction of the Ancient and Middle empires particularly employed limestone, while that of the New Theban empire rather used sandstone; on both sides the preference is explained by the desire of a supply in the vicinity of the works.

Commonly the Egyptians employed stones of medium proportions, 4.9 to 8.2 ft. long, 2.6 to 3.3 ft. high and frequently less. Most columns were made of piles of drums, and those with considerable diameters were formed by grouping several sectors. The same for the architraves; when enormous ones were required as for the central nave of the columnar hall at Karnak, they were composed of two beams set beside each other. (42, 1).

It is no less true that the Egyptians had a weakness for great blocks. In the time of the II dynasty, there were cut for the Tomb of Nofir Ka at Zaouyet el Aryan slabs of granite of more than 389 cu. ft. volume; the epoch of the great pyramids commonly quarried in the same material blocks 16.4 to 23.0 ft. long and 4.9 to 8.2 ft. wide. There exists and dates from the reign of Amenophis III a shaft of a column in rose granite measuring 18.9 ft., and another, marked by the cartouche of the last king of the XVIII dynasty, whose length attains 21.3 ft.; in the ceiling of the columnar hall of Karnak are architraves 31.2 ft. long, 8.5 ft. wide and 4.9 ft. deep, and their volume may be estimated at 109.2 cu. ft. and their weight at 71.5 tons; the great pylon of the same Temple, a Ptolemaic work, exhibits a lintel of 26.3 ft. Likewise the cutting of these monsters was play for the men, who cut out in rose granite, transported from Assouan to Karnak and erected without accident monolithic needles 105 ft. long! [1]

Note 1. That is the height of the obelisk of S. John Lateran at Rome. One of those that queen Hatshepsouet caused to be erected in the Temple of Karnak, and which is still in place, measures 100.7 ft. with a side of 8.7 ft. at the base.(12).

To avoid the risk of injury in the course of the journey and the setting, the stones reached the works merely roughed out, excepting on their lower beds and ends. After setting in place the tops were leveled and a chamfer indicated the borders of the external face; after completing the construct-

construction, this draft served to guide the surfaces. Every time they took the trouble, Egyptian stonecutters realized m marvels of accuracy and finish.

The Egyptian constructor was acquainted with plaster of paris, but he prepared it very crudely and employed it mixed w with sand. From a mixture of lime and sand, sometimes with the addition of pounded bricks, he knew how to obtain a mortar of good quality, sometimes very hard and adhesive.

II. The Methods.

The miraculous preservation of parts of the tombs of the I dynasty, notably that of Qua at Abydos, reveals to us how the carpenters of primitive Egypt constructed a wooden wall by i inserting the verticals and planks in the mortises of a sill, that they embedded in the still wet mud of the soil. (42, 1).

As revealed by the remains of articles of furniture, representations painted or sculptured and also certain decorative forms of architecture in stone, models of structural arrangements executed in wood, Egyptian carpentry appears very expert. It practised our present system of connecting by dovetails, by tenons and mortises, by housing and by concealed dowells. It had organized ingenious procedures for the consolidation of a structure, in the first rank of which must be mentioned the triangular arrangement, with stiffening by diagonal members; this was currently employed when the dimensions were small (38); but as soon as these were enlarged, the defect of rigidity limited it to the inferior system of square framing and to the twofold necessity of placing the posts closer and of increasing the number of cross beams. (40).

The Wall.

The Egyptian masonry associated in a surprising manner minute precautions and astonishing negligences. As a type of the latter may be cited the general inefficiency of the foundations. However considerable might be the weight of a monument, its substructure scarcely extends into the ground, but again this was little or not at all required. Thus at the T Temple of Seti I at Abydos, it was reduced to a single course of badly balanced blocks; the gigantic columns of the columnar hall at Karnak have as foundations wretched masses of rubble, whose section is sometimes less than their own. At the

Temple of Luxor, under the more ancient parts of the
[illegible]
ers, each one 2.6 ft. high. The Ramesseum offers the exam-
ple of a support of a [illegible] of mass of dried bricks about
3.3 ft. high. Not before the Ptolemaic period are found fo-
[illegible]
the other hand, the Egyptian column possessed in the large d
[illegible] serving it as a base a footing more than sufficient. Cer-
tainly [illegible] was limited to localize the area of the fo-
[illegible] by means of [illegible]. In truth,
[illegible] the valley of the Nile [illegible]
[illegible]
[illegible] placed on a layer of [illegible] not connect it wi-
[illegible]. Indeed from other examples the Egypt-
ians defended the stability of their structures.
Executed in bricks, Egyptian masonry employed dried squares
and comprised between the courses a bed of pasty clay, pure
[illegible]
times -- thus at the pyramids of Dahchour and of Hawara -- men
substituted for it [illegible] a layer of sand, [illegible]
[illegible]
[illegible]
[illegible] sizes, often made into a mat (99, 5). The body of the
[illegible] by it was held at other times by anchors of joists or
of planks embedded in the mass. It was not rare for the ver-
tical joints to be left open, a peculiarity also favorable to
[illegible]
[illegible]
by means of [illegible], generally not vertical but sometimes incl-
ined more or less, in proportion to the corrections in level-
ing necessary to make. (99, 2, 3, 4).
On a soil like that of Egypt, a wall in crude bricks is ex-
posed to several sorts of deterioration. During the period
[illegible]
[illegible]
[illegible] produced by their construction; when that dries
it cracks and splits by the successive contractions in drying.
Besides, the total mass being [illegible], it [illegible] for a co[illegible]
to be slightly inclined [illegible] of the base [illegible]

Temple of Luxor, under the more exposed parts because of the vicinity of the Nile, it is well if one can count three courses, each one 2.6 ft. high. The Ramesuueum offers the example of a support of a species of mass of dried bricks about 6.6 ft. thick. Not before the Ptolemaic period are found foundations extending 16.4 to 19.7 ft. into the ground. But on the other hand, the Egyptian column possessed in the large d disk serving it as a base a footing more than sufficient. Normally preparation was limited to leveling the area of the future edifice and compacting it by means of ramming. In truth, once dried and piled, the humus of the valley of the Nile acquires a remarkable incompressibility, and the fact that it is ordinarily placed on a layer of mud did not connect it with deep excavations. Indeed from other expedients the Egyptians demanded the stability of their structures.

Executed in bricks, Egyptian masonry employed dried squares and comprised between the courses a bed of pasty clay, pure or mixed with straw, whose thickness averaged 3/8 inch. Sometimes -- thus at the pyramids of Dachour and of Haoura -- men substituted for this a layer of sand, very suitable to ensure at the same time the equal distribution of the loads and the drainage of the structures; or again this was a mattress of alfa grass, often made into a mat.(39, 5). The part of tie played by it was held at other times by anchors of joists or of trunks embedded in the mass. It was not rare for the vertical joints to be left open, a peculiarity also favorable to drying. Ordinarily bricks were set flat in lines across the wall. At different heights were constructed leveling courses by means of tiles, generally set vertical but sometimes inclined more or less, in proportion to the corrections in leveling important to make. (39, 2, 3, 4).

On a soil like that of Egypt, a wall in crude bricks is exposed to several sorts of deterioration. During the period of the inundation, it is saturated during the day by vapors issuing from the heated earth, and in the night is swelled by the water produced by their condensation; when that abates, it cracks and splits by the successive contractions in drying. Besides, the moist clay being soapy, it suffices for a course to be slightly inclined for a slipping of the mass supported

by it ... [illegible]

[illegible]

construction and the rules of settlement ... [illegible]

[illegible]

the various ... the Egyptian architects protected them-selves by the aid of one of those expedients, both simple and ingenious, to which they were accustomed.[1]

Note 1. The author took this explanation from the work of A. Choisy on Egyptian Construction.

They first divided the length of the wall into sections ab- [illegible] courses were concave, while ... of the ... the longitudinal outline was horizontal or convex. The advantag-es of the system were ... the division of the wall ... [illegible]

Note 2. See in volume II ... appears in ...

[illegible] or ... by the ... or ... of ... by the ... of ... wooden ... [illegible]

[illegible] and paintings, and certain decorative forms ... the ... of structural forms. (Choisy, see page 52).

The ... [illegible] ... without ... by ... — thus at the ... wall of Karnak and on the temple of Seti I at A- [illegible] by the aid of cramps made in dovetail form in sycamore wood. [illegible] the existence of ... shown by the form of ...

by it to occur; such an accident further menaces stone masonry on a clayey footing. Common likewise to the two kinds of construction are the risks of settlement in consequence of an undermining of the subsoil saturated with water. Against these various perils, the Egyptian architects protected themselves by the aid of one of those expedients, both simple and ingenious, to which they were accustomed. [1]

Note 1. We borrow this explanation from the work of A. Choisy on Egyptian construction.

They first divided the length of the wall into sections absolutely independent, alternately long and short. Each one of the first exceeded the alignment of the second, and its c courses were concave, while for the two collateral bays the longitudinal outline was horizontal or convex. The advantages of the system were evident; the division of the wall ensured to it a certain elasticity and localized the movements; the curvature of the courses opposed slipping by forming at regular distances a stop fixed in a sort of notch in the ground.(41). [2]

Note 2. See in volume II an analagous system in Japanese construction.

For injuries that might be caused on the structural surfaces in crude bricks by the rain, the wind, or contact of men, these were prevented by the application of coatings, woodwork, mats and protectors made of reeds. [1]

Note 1. See the paneling in the interiors of several protohistoric tombs; the representations of edifices on the reliefs and paintings, and certain decorative forms retaining the memory of structural forms. (further, see page 82).

The construction in stone materials proceeded with open joints and without connection by mortar. Sometimes -- thus at the columnar hall of Karnak and on the Temple of Seti I at A Abydos -- it united two blocks adjoining in the same course by the aid of cramps made in dovetail form in sycamore wood. Each time that circumstances permitted,perfect contacts were realized. According to Herodotus, the facing of the Great Pyramid was"so well fitted", that the entire covering appeared to be a single block". His statement deserves credit from t the excellence of the masonry shown by the Tomb of Nefer Ka

(II dynasty), certain funerary chapels contemporary with the III dynasty, the base of the Pyramid of Mycerinus, the Temple of Granite, or even the grand gallery of the Pyramid of Cheops, the last being so remarkable, that to use the expression of the Arab Abd-ul-Latif, "one could insest into the joints neither a needle or even a hair!"

Egyptian architecture had too much feeling for the beautiful to not desire it and too much power to not realize -- wherever the conditions were favorable -- the regularity of beds, verticality of joints and equality of courses. But too frequently for economy it was compelled to not only resign itself to variations from level, but even to accommodate blocks of irregular shape, left to correct defects by filling with small stone chips, fitted or set in mortar. From the New Theban empire the question of appearance of the construction was simplified, because of the system of covering the entire surface of a wall or of a column by figures or inscriptions, which i introduced the necessity of a facing of stone suitable for carving or of a coating of stucco.

At all times, the Egyptians practised the economical system, that realized a mass by means of a constructed shell, the void being filled with sand, mud or gravel.(39, 6, 7). A stone
68 wall was always constructed with two independent faces. If its height were small, these were placed against each other; as soon as this bacame considerable, they were separated from each other, that of the internal side being vertical, while the exteroal rose with an inclination attaining even to one tenth the height; in the case of a pylon, both were inclined.[1] As for the void, it was filled with stone chips and even with sand; a detestable practice, since a breach in the shell permitted an escape of the filling, and the oblique facing was overbalanced and fell. The same principle appeared in the construction of great columns. Thus at Luxor each drum was m made of a ring of several blocks, the central hollow being f filled with mortar and pounded bricks.

Note 1. This inclined elevation was constantly employed by Egyptian construction -- doubtless because in was seen an element of stability -- and evidently was derived from that given by the example of the dykes of the valley.

The ordinary cap of a window opening was a lintel of stone or of wood, according to whether the construction was of stone or of bricks, and which was supported either by the parts of the wall next the opening or by the inclined jambs. Rarer but not exceptional was the form of the arch.

The Site and its Covering.

For the site of a modest structure, the Egyptian architect was satisfied with tamped mud. If it concerned an important edifice, there was established either a bed of bricks covered by a layer of mortar or a floor under a coating of plaster, placed on timbers isolating from the earth, venerable remains of which are offered by the tombs of the first dynasty; or again a pavement of perfectly jointed stones, or finally a layer of enameled tiles. At the Palace of Amenophis IV at Tell el Amarna were superposed from bottom to top a bed of bricks, a layer of mortar from 1/2 to 1 inch thick, finally another -- very thin -- of gypsum mixed with fibrous materials, which was painted, then polished and made impermeable.

For the problem of the covering, the Egyptians proposed various solutions. The earliest in date doubtless utilized reeds or rushes curved to form rough outlines of trusses (28,1), whose images have been preserved to us by the canopies of historical Egypt.(42, 4). Then the ceilings were made of round palm trunks or of timbers cut from more resistant woods; after having placed on them a mat of interwoven reeds, they were covered by a layer of clay well settled, which contained a l ledge formed by an offset of the wall,or by a course of bunches of reeds.(49, 3).

Yet quite early, at least from the epoch of the II dynasty as proved by the Tombs of Naga ed Der, Egyptian construction in bricks knew how to realize the covering by means of a vault. To the system of the tunnel vault it first had recourse, for which its preference was already marked; but it also utilized that of the dome.(42, 7).

In the application of both was readily employed the method of corbelled courses; it further knew how to select for constructing them the pointed curve, the most practical of profiles, and arranged to avoid the scaffolding, difficult in a country poor in wood.

Soon even -- the tombs of Bet Khallaf and of Requaquah, contemporary with the III dynasty, furnish the proof of this -- it understood how to arch a half cylinder by the method of radial courses, doubtless modeling in earth the form to support the ring under construction.(42, 15, 16). In truth, these primitive tunnel vaults were rough, irregular, and their span was quite small. That closing the corridor of the Tomb of Nefer Khat does not exceed 4.1 ft. in clear width. The m materials were ordinarily the same as for the walls, the angular crevices at the outside of the crown being stopped by a filling of clay. Sometimes instead of the tiles were employed true voussoirs, their trapezoidal form bein produced either by the addition of two wedges of mud to the sides of a still wet normal brick, or by the removal of two flakes at the sides of a dried brick.

Yet the method of construction by rowlock arches obtained favor in Egypt; indeed it was most appropriate for the natural conditions of the country, since it required no centres. (42, 9, 10, 11). Various artifices facilitated its application; walls were carried as high as possible by corbelling out their upper portions; for the vault were employed thin tiles,[1] sometimes slightly curved lengthwise, with two or three grooves on their lower surfaces to favor the adhesion of the mortar; the arches were inclined against a backing wall; several shells were superposed, even four; finally sections comprising the least difficulties were chosen, the pointed arch, the segmental arch, and especially an ellipse with three centres corresponding to a group of two right-angled "Egyptian" triangles with their smaller sides adjoining.(42, 10, 11).

Note 1. At the storehouses of the Ramesseum, they were 2 ins. thick, 11 3-4 ins. long and 5 7-8 ins. wide.

The most ancient known example of this type of tunnel vault is offered by an oblique tunnel vault in a tomb at Dendera, that of Adou I, director of the works of the Pharoahs Pepi I and III of the VI dynasty; it is a circular arch composed of the superposition of four rings. The most remarkable are seen in the storehouses of the Ramesseum; the four arches are connected, 11.8 ft. wide and extending to 15.3 ft. above the ground.

[illegible] not disturbed by the thickness of the walls, which exceeds [illegible] at the [illegible].

[illegible]

[illegible] that its sides are to each other as 3, 4 and 5.

For stone construction, the ordinary system of covering was a ceiling of slabs set on the walls and on the architraves of the colonnades (93, 5). The span was sometimes reduced by an enlargement of the upper part of the wall (92, 3; 4): thus it is in the sanctuaries of the Temple of Seti I at Abydos. (92, 5). If it was exposed to pressure, it was protected by the [illegible] of a discharging arch, such as shown by the openings of the great pyramid and one of the corridors of the Temple of Deir-el-Bahari (93, [illegible]).

But the vault in stone was not exceptional. Sometimes it solved from a corbelling of the upper courses of the two opposite walls, the classes [illegible] either well preserved -- as in the grand gallery of the Pyramid of Cheops -- or properly cut according to a circular arc, as in the previously mentioned corridor of Deir-el-Bahari. Sometimes it was formed by the [illegible]

[illegible]

in the Great Pyramid [illegible] of one of the cells above the royal chamber; the covering of the chamber of the [illegible]

[illegible]

vault of the previously mentioned gallery of Deir-el-Bahari. (

[illegible]

on form, at first with rectangular blocks fitted at the outside with stone [illegible], and from the Saitic epoch with trapezoidal voussoirs. (92, 17).

[illegible]

[illegible] of the [illegible] walls. [illegible]

by the pavement [illegible] of the [illegible]

Resistance to thrust was ensured by the thickness of the walls, which attained 12 ft. at the Ramesseum.

Note 2. The right-angled triangle denominated by the ancients "Egyptian" or "sacred" is distinguished by the peculiarity, that its sides are to each other as 3, 4 and 5.

For stone construction, the ordinary system of covering was a ceiling of slabs set on the walls and on the architraves of the colonnades.(42, 2). The span was sometimes reduced by an enlargement of the upper part of the wall (42, 6; 43); thus is it at the sanctuaries of the Temple of Seti I at Abydos. (42, 5). If it was exposed to pressure, it was protected by the artifice of a discharging arch, such as shown by the chambers of the great pyramid and one of the corridors of the Temple of Deir-el-Bahri.(42, 8).

Yet the vault in stone was not exceptional. Sometimes it sprung from a corbelling of the upper courses of the two opposite walls, the offsets being either well preserved -- as in the grand gallery of the Pyramid of Cheops -- or properly cut according to a circular arc, as in the previously mentioned corridor of Deir-el-Bahri. Sometimes it was formed by the meeting of two rows of slabs of equal height set on the tops of the walls and inclined toward each other; sometimes for greater security, this arrangement was doubled or trebled. As examples we will cite the ceiling of the "queen's chamber" in the Great Pyramid and that of one of the cells above the royal chamber; the covering of the chamber of the Pharoah Ounas (V dynasty) in his Pyramid of Saccara; the discharging v vault of the previously mentioned gallery of Deir-el-Bahri.((42, 13, 8). More rarely it was a tunnel vault constructed on forms, at first with rectangular blocks fitted at the outside with stone chips, and from the Saitic epoch with trapezoidal voussoirs. (42, 17).

In brief, from a very early period Egyptian construction h had at command the varied and practical means, and its productions possessed in the highest degree the essential quality of stability. With its inclined walls pushing toward the interior, its thick ceilings strongly stayed by the equilibrated pressures of the four walls, its columns fixed at the bases by the pavement and at the tops by the load of the architrave,

an Egyptian edifice carefully built in stone should endure as long as the ground does not yield beneath its basis.

Chapter 5. The Effect.

Voewed in regard to the effect, Egyptian architecture reveals a very vivid taste and a very assured sense of the matter; at the same time a certain knowledge and a moderate research in the beauties of harmonic order; on the other hand an intense exploiting of all that could please the eye and strike the imagination; the passion for and the science of adventitious ornament, a remarkable appropriateness of invention to the conditions of the place and the purpose; finally the skill of the decoration and the perfection of the execution.

I. Effects of Harmonic Order.

When it concerned the arrangement of an entirety or the proportioning of the parts of a whole, Egyptian esthetics left entire liberty, on this side of the limits set by the necessity of satisfying the eyes.

It was inspired by regularity and symmetry. However developed might be a temple, however numerous had been the additions to the original plan, it was no less rigorously arranged about an axis, from its most distant approaches as far as the holy of holies. On each side of the central avenue traced on the one hand by the succession in a straight line of the preliminary avenue of the sphynxes or rams and the different gateways; on the other by the enlargement of the middle intercolumniation of the portico vestibule and of the middle aisle of the columnar hall, balanced each other, equal in the relative number and dimensions and similarly arranged; the sphynxes, obelisks, succession of pylons, colossal statues set against their fronts, and the masts bearing flags, areas of the courts, extent of the halls, groups of isolated supports and series of chambers and small cells. Even the drawing of a garden was entirely geometrical, and the right line reigned despotically there.(20).

It was always necessary for a system to be absolute; yet E Egyptian architecture sought the appearance of regularity rather than the reality. In truth, nothing is more rare in its productions than an exact balance of outlines and additions, an entire equality of two corresponding dimensions, an absolute parallelism of two walls or of two opposite rows of columns.

[illegible]

different motives, not only on monumental parts in sequence, but even to elements of the same species grouped in a series. Thus it was not fear to arrange a court colonnade with columns of different forms,[1] and that it did not hesitate to group together several types of isolated supports.[2]

Note 1. For example, those of the second court of the Tem- [illegible] form faces one of seven sides.

Note 2. [illegible] ated, from the exterior a row of Osiris piers and of campaniform columns succeed on the ramps of the temple of Karnak, I [illegible] cupied, that an enclosure of piers surrounds a nucleus of columns, and in the colonnades [illegible] the capitals of the columns [illegible] ces of the time of the Ptolemies -- an example of this may be seen in the first court of the great Temple of Isis at Ph- [illegible]

Egyptian architecture never applied the principles essential to Greek art, of fixed proportions in the same arrangement and of the dependence of all dimensions upon one of these, [illegible] to the whole. In the same edifice and even in the same portico, supports exactly similar are placed at different intervals; two columns of the same type and the same diameter have very different heights; two rows of columns absolutely similar support architraves of very unequal heights. In brief, [illegible]

This is not to assert that the architects on the banks of the Nile were ignorant of the aesthetic virtues of number; on

Even more, Egyptian architecture nowise objected to impose different aspects, not only on monumental parts in sequence, but even on elements of the same species grouped in a series. Thus it did not fear to arrange a court colonnade with porticos of different forms,[1] and that it did not hesitate to gro-
74 up together several types of isolated supports.[2]

Note 1. For example, those of the second court of the Temple of Ramses III at Medinet Habou present, the eastern and the western Osiris piers, and the other two have papyrus bud columns (54); a contrast still more significant in the first court of the same edifice, where a row of columns of papyrus form faces one of seven piers.

Note 2. Thus at the portico vestibule of the Temple just cited, from the exterior a row of Osiris piers and of papyriform columns succeed bud columns; at the Temple of Karnak, t the columns in four rows of the walk of Thoutmosis is so arranged, that an enclosure of piers surrounds a nucleus of columns, and in the columnar hall the capitals of the columns are bell-shaped beneath the ceiling of the great nave and totiform under that of the side aisles. Finally, certain porticos of the time of the Ptolemies -- an example of this may be seen in the first court of the great Temple of Isis at Philae -- exhibit as many varieties of capitals as there are columns.(65).

Egyptian architecture never applied the principles essential to Grecian art, of fixed proportions in the same arrangement and of the dependance of all dimensions upon one of these, chosen as the unit. There is no more constancy in the ratio of solids and voids than in that of one part to the others or to the whole. In the same edifice and even in the same portico, supports exactly similar are placed at different intervals; two examples of the same type and the same diameter have very different heights; two pairs of columns absolutely similar support architraves of very unequal heights. In brief, Egypt never conceived the necessity of "orders" in architecture more than that of a fixed metre in poetry.

This is not to assert that the architects on the banks of the Nile were ignorant of the harmonic virtues of members; on

[illegible]
of commensurate dimensions, of simple relations and of utili-
ties conformed to certain general conventions. Evidently, it
is not the effect of chance — ignoring negligible fractions
on account of the importance of the dimensions, that [illegible]
[illegible] the heights of the great pyramids of Gizeh, or
[illegible] that of [illegible], and [illegible] of the
[illegible] common to all; that the [illegible]
[illegible]
[illegible] of the façade into three stories of the same heig-
ht, respectively corresponding to the substructure, to the
row of shafts of the peristyle, and the entablature, and si-
milarly [illegible] three equal zones; that the dimensi-
ons of [illegible] seems to be governed by the ratio of 2
[illegible]
[illegible] measure twice the thickness; that a table of rows of 1
[illegible] reports of [illegible], porticos or halls, reveals a
[illegible]
it is no less significant, that as the basis of many arrange-
ments is discovered a geometrical relation, such is the rela-
tion of the height of the pyramids mentioned to the sum of
[illegible] sides at the base and that of the radius to the circum-
[illegible]
[illegible] of [illegible] a triangle or of two placed against each oth-
[illegible]
sides are to each other as 3, 4 and 5, etc. [1]

*Note 1. On the use of the "Egyptian triangle", see in Volu-
me 3 of this history the section devoted to effect in our st-
udy of Egyptian architecture.*

[illegible]

To a very high degree and very early, Egyptian architecture
tended to ensure to its productions the advantage of admira-
ble achievement and of sometimes overwhelming emotion, by mo-
numents [illegible] themselves [illegible] by the [illegible] of [illegible]
[illegible]
[illegible] by the removal of 207,000 cu. ft., the volume of the 2
[illegible] for the sepulchre
of the King [illegible] ([illegible] dynasty), as well as the base of

the contrary, they early appreciated the esthetic advantages of commensurate dimensions, of simple relations and of outlines conformed to certain general constructions. Evidently it is not the effect of chance -- omitting negligible fractions on account of the importance of the dimensions, that expressed in cubits the heights of the great pyramids of Gizeh, or of that of Snofrou at Meidoum, and their perimeters at the base are figured in ratios common to all; that the measures of the little destroyed Temple of Elephantine reveals the divisibility of the facade into three stories of the same heights, respectively corresponding to the substructure, to the row of shafts of the peristyle, and the entabalature, and also that of the last into three equal zones; that the dimensions of Egyptian bricks tend to be governed by the ratio of 2 to 1, the length being the double of the width, that in its turn contains twice the thickness; that a table of rows of i isolated supports of ceilings, porticos or halls, reveals a marked preference for the number 6, its multiples and factors. It is no less significant, that as the basis of many arrangements is discovered a geometrical relation, such is the relation of the height of the pyramids mentioned to the sum of t their sides at the base and that of the radius to the circumference; such again is the possibility of inscribing in a number of outlines a triangle or of two placed against each other, and more particularly of the right-angled triangle, whose sides are to each other as 3, 4 and 5. etc. [1]

Note 1. On the use of the"Egyptian triangle", see in Volume 2 of this history the section devoted to effect in our study of Sassanian architecture.

II. Effects of picturesque or affected character.

To a very high degree and very early, Egyptian architecture desired to ensure to its productions the advantage of admiring astonishment and of sometimes overwhelming emotion, by which men found themselves affected by the spectacle of the material grandeur, that manifested itself from protohistoric t times by the removal of 217,700 cu. ft., the volume of the e excavation undertaken at Zaouyet-el-Aryan for the sepulchre of the king Nofir-Ka (II dynasty), as well as the area of

[illegible] (III dynasty).

A measure of the passion for the colossal at the end of the IV dynasty is furnished by the choice made by the constructor of the Pyramid of Cheops for the case of his monument of nearly 13.5 acres area with a volume of more than 88,000,000 cu. ft., proportions such that their perception exceeds the powers of the eye and requires an effort of thought. (9). Proofs abound of the vogue of this sort of effect until the end of the ancient history of Egypt; extension of the Temple of Amon at Karnak to make it measure 11[illegible] ft. long and more than 5/8 mile in perimeter; enormous size of the columnar hall of the same edifice, whose area of 5[illegible] sq. ft. exceeds one third of all the aisles composing S. Peter's of Rome and the entire area of Notre Dame of Paris ([illegible]); erection of obelisks more than 9[illegible] ft. high; dimensions of the subterranean tomb of Petamenope of the Saitic epoch (XXVI dynasty) in the Theban necropolis of El Assasif, which measures in length 8[illegible] ft. with an area of 2[illegible] sq. ft., etc.

Indeed Egyptian architecture undertook now to create the illusion of that material grandeur so essential to its aesthetic ideal. [illegible] sought to produce some proportional optical illusions. Thus besides advantage from the property of perspective, that di-[illegible] ce, it increased the apparent depth of a temple by adopting from the court to the most distant hall a progressive elevation of the ground and a lowering of the ceilings, such that [illegible] of the columnar hall (Fig. [illegible]).

[illegible] Temple of Edfu [illegible] about [illegible] ft., the floor of the sanctuary is 5.[illegible] ft. above that of the court.

This was doubtless not the sole merit of this arrangement in the judgement of Egyptian architects, as it favored the birth of a state of moral depression, [illegible]

129,644 sq. ft. at Saccara covered by the stepped Pyramid of Pharaoah Zozer (III dynasty).

A measure of the passion for the colossal at the end of the IV dynasty is furnished by the choice made by the constructor of the Pyramid of Cheops for the base of his monument of nearly 13.6 acres area with a volume of more than 88,220,000 cu. ft., proportions such that their perception exceeds the powers of the eye and requires an effort of thought. (9). Proofs abound of the vogue of this sort of effect until the end of the ancient history of Egypt; extension of the Temple of Amon at Karnak to make it measure 1197.6 ft. long and more than 5/8 mile in perimeter; enormous size of the columnar hall of the same edifice, whose area of 57,590 sq. ft. exceeds one third of all the aisles composing S. Peter's of Rome and the entire area of Notre Dame of Paris (45); erection of obelisks more than 98.4 ft. high; dimensions of the subterranean Tomb of Peteamenope of the Saitic epoch (XXVI dynasty) in the Theban necropolis of El Asasif, which measures in length 863 ft. with an area of 24, 371 sq. ft., etc.

Indeed Egyptian architecture understood how to create the illusion of this material grandeur,so essential to its esthetic ideal. Its means consisted of artifices in arrangement adapted to produce some propitious optical illusions. Thus desiring advantage from the property of perspective, that diminishes the height of objects in proportion to their distance, it increased the apparent depth of a temple by arranging from the court to the most distant hall a progressive elevation of the ground and a lowering of the ceilings, such that the height of the farthest interior was scarcely more than h half that of the columnar hall.(46, 1). [1]

Note 1. At the Temple of Khons at Karnak, whose length is about 213 ft., the floor of the sanctuary is 5.3 ft. above t that of the court.

This was doubtless not the sole merit of this arrangement in the judgement of Egyptian architects. As it favored the birth of a state of moral depression, it should in its turn produce feelings of reverence. It satisfied their great desire of strongly affecting the imagination and of arousing vi-

vivid emotions. This preoccupation with an impressionist effect is evident in several peculiarities of arrangement and construction, that are observed in the temples on the banks of the Nile, such as the repetition of the series of pylons, courts and halls, good for overpowering the mind; such was the relative difficulty of access by a small number of doorways and their narrowness in proportion to the breadth of the sites -- a difficulty yet increased from the Ptolemaic epoch by closing at mid-height the intercolumniations of the portico vestibule (44; 65; 66); such particularly was the wisely graduated lighting from the threshold to the holy of holies. (44). Dazzling in the court of honor, diminished beneath the porticos and reduced in the vestibule, the light gave place in the columnar hall to a dimness, whose mystery was even increased by some rare and slender rays falling from the clearstories of the central aisles and the narrow holes opened in the ceilings of the side aisles; in the sanctuary reigned obscurity, that became black darkness in the holy of holies.

III. Effects of Monumental Relief.

The great effects of monumental relief were nearly foreign to Egyptian architecture. Nothing more simple, more calm than the forms of its monuments. Every plan was inscribed in the regular outline of a parallelogram and every silhouette was rectilinear; every elevation definitely sacrificed height to length; nothing but great monotonous masses and nearly solid facades, where they were not entirely blind (47).

The form of a mastaba was that of a truncated pyramid slightly battering (10 to 15 degrees), oblong and squat; its length was frequently twice its width and five times its height.

Erected on a square or slightly elongated plan, the pyramid was at first a group of seven mastabas, whose proportions diminished from one story to the next; this is revealed at Saccara by the Pyramid of Zoser, which still possesses six of t these terraces, and at Meidoum by that of Snofren, which has no more than three. That erected by the last Pharaoh at Dachour -- 699 ft. long and 324.8 ft. high -- proves that since the end of the protohistoric epoch was invented the properly pyramidal type with continuous faces inclined at about 52°,

[illegible]

...ed and Mycerinus at Gizeh, and perhaps ... in ex- ... until the ... period. The height of these monuments was moderate; the relation of height to length was at Dashour 1 to 6.1, at Sac- ... 1 to 5, at Gizeh 1 to 1.8. ... preferred than more ... and at least equalized the vertical and longitudinal ... An original variation is presented by the great ...

[illegible]

... on a mastaba with sides inclined at nearly 5? and ... a pyramid with inclination of about 45°.

..., ... effected by the New emp- ..., notably in the region of ..., that of a pyramid plac- ed on a ... at first subordinated to the point that its height generally does not exceed one fifth of the ...

[illegible]

... temple presented the appearance of a sort of ... -- a ... -- its longitudinal ... walls, ..., outer walls of the columnar hall and ... of the sanctuary.

[illegible]

..., whose facades rise vertically and are opened like ... (59).

The proportions of monumental forms just shown are exhib- ited once by the fact of adaptation of the artistic creation to the natural and local conditions, and by the perfect sincerity which is one of the essential traits of architecture in ...

[illegible]

which was magnificently realized for the buildings of Cheops, Chefren and Mycerinus at Gizeh, and remained canonical in Egypt from the IV to the XII dynasty, in Ethiopia until the Roman period. The height of these monuments was moderate; the
79 relation of height to length was at Dachour 1 to 2.1, at Saccara 1 to 2, at Gizeh 1 to 1.6. Ethiopia preferred them more slender, and at least equalized the vertical and longitudinal dimensions. An original variation is presented by the great Pyramid of Dachour (base 618.7 on each side; height 319.1 ft.), which doubtless dates from the XII dynasty; the outline is broken, as if on a mastaba with sides inclined at nearly 55° had been placed a pyramid with inclination of about 43°.

Well, the composite form appeared, affected by the New empire, notably in the region of Abydos, that of a pyramid placed on a rectangular base; at first subordinated to the point that its height generally does not exceed one fifth of the t total height, the substructure increased rapidly until the second element was reduced to the condition of a simple termination.

On account of its plan, invariably a greatly elongated rectangle, sometimes extended without measure, its moderate elevation, its battering walls, solid and plane, and finally its terrace roofs, an Egyptian temple presented the appearance of a sort of bench -- a colossal mastaba -- its longitudinal sky line being scarcely accented by the unequal altitudes of the enclosing walls, courts, outer walls of the columnar hall and those of the sanctuary.

A sole exception was formed by the temple in form of a kiosk, whose facades rise vertically and are opened like porticos.(34).

The peculiarities of monumental forms just shown are exhib-
80 ited both by the fact of adaptation of the artistic creation to the natural and local conditions, and by the perfect sincerity which is one of the essential traits of architecture in Egypt.

And first they are really a reflection of those precisely characterizing the Egyptian landscape, and whose impression upon men is as strong as general; simplicity and monotony of

an outlook everywhere comprising the trinity of a river avenue in the midst of two bordering plains and two lateral bluffs; the predominance of horizontality, on the one hand the consequence of the equal flatness of the river and of the alluvial lands of the valley, and on the other of the slightly less constant level of the crest of the bluffs limiting the horizon.

On the other side, the preponderating horizontal lines, the inclination of the battering surfaces exhibit at first sight the construction of edifices covered by ceilings and consolidated by a broad extension of their bases, while the scarcity of openings announces the protection of interiors, both from excess of light and from public curiouity, so odious to the oriental. Without counting the idea of absolute stability a aroused by the appearance of these monuments widened at the base, squat and solid, exactly responds to the desire of duration, to that prepossession with the eternal, which forms one of the most characteristic traits of the mental originality of Ancient Egypt.

From this perfect accord of the general forms of Egyptian edifices with their natural surroundings; of the propriety of their conception of the house of the dead and of the house of the god, and finally from the frank manifestation presented by them, of both the programmes and of the system of construction, must be produced the primary quality of a monumental aspect; a necessary condition and in large measure a sufficient cause of beauty and of character.

IV. Effects of Secondary Relief.

With regard to the secondary effects produced by the conformation of the elements of an elevation, Egyptian architecture is always remarkable for a very varied feeling, according to whether it concerns a wall or a portico; almost entire indifference in the first case, a vivid and constant interest in the second.

87 Relief of the Wall.

It is doubtful if there can be a question of modeling in regard to an Egyptian wall of the historic age, in view of the little of which it was perceptible was localized at its upper

perimeter, and that its conception was that of a rare monotony.

In the time of the three first dynasties, for example, the tombs of the Thinite epoch discovered at Negada and at Nezlat=Batran -- brick construction followed a method which always prevailed in Mesopotamia, (page 142), that of recesses. On an external surface were arranged equidistant vertical recesses, separated by intervals of 8.6 to 8.9 ft., a sort of niches 5.5 to 5.9 ft. wide and 1.8 to 2.6 ft. deep; secondary recesses were frequently sunk at the back and sides, whice at the same time were hollowed out in the intermediate pilaster three grooves of rectangular section and equally spaced. This scheme -- again found in the time of the XII dynasty on the walls of the second fortress of Abydos -- offers the advantage of somewhat animating the mural surfaces, thanks to the contrasts of light and shade produced by the sunshine.

A wall of stone of the historic age was only enhanced by r relief along its lateral angles and its crest.(40). The form of the first is a great round, and of the second is a cornice formed by placing on it a torus, a cavetto and a band, presenting a characteristic example of the survival and transposition into the decorative order of a form of the structural order fallen into disuse. The angle moulding is an image of t the bundles of reeds, with which was finished the corresponding part of a structure of tamped earth most exposed to injuries, or again that of the bundles of rushes, that formed the angular framework of wattled huts. Likewise for the cornice; the first view recognized the elements of the parapet by which the mud construction supported the layer of clay of its t terraces; a series of bundles fixed at the crest of the wall with a hedge of palm ribs fixed in them and curving outwards, both under the weight of its upper portion and the thrust of the terrace of the covering. Not merely the decoration facilitates the recognition of the primitive state; for on the torus is represented a winding ribbon, recalling the fastenings of the bundles and attaching them to the wall, and the cavetto is decorated by vertical channels, which evidently are the conventionalized image of the grooves of a palisade.(49,1,2).

These mouldings render the precious service of preventing

the outline of the edifice from being lost in the dazzling i illumination of the Egyptian atmosphere. On the one hand, t the dark band formed by the projection of the angle round and especialy by the very prounaunced concavit of the cavetto of the cornice; on the other the band of light sustained by the warm blue of the sky and extending along the convex surface of the moulding and on the band of the crest, marking the out-lines by a double line, one dark and the other luminous. (40; 48; 67).

It is in the same spirit, that rarely in Pharaonic times b but on the contrary, frequent in Ptolemaic epoch, the band was crowned by a sort of battlement, generally composed of a series of erect serpents bearing the solar disk, or again by
83 a row of dog-headed apes, like the case at the greater Temple of Ipsambul, where their height attains about 8.2 ft.

Within this sort of border no architectural relief accented the surfaces. It is true that in the time of the New empire, they were claimed by the scribes, sculptors and painters char-ged with making public the sacred images, the consecrated te-xts and the glory of the Pharaohs. Entirely exceptional app-eared the sketches of a sculptured arrangement; such as on t the south wall of the central terrace of the Temple of Deir-el-Bahari, a design of wide pilasters scarcely projecting 3 ins.; or again presented by the external enclosure of Luxor and by the substructure of the principal Temple of Elephanti-ne, a movement in accordance with the profile of a plinth cr-owned by a cornice and set on a step.

Yet for the head of a wall and for a part of a surface opp-osite the extremity of a row of detached supports, Egyptian architecture knew how to find the appropriate form; in the f first case that of a pier, and in the second that of a pilas-ter; both crowned by a cornice.(50).

Similarly from the primitive epoch, it understood how to d derive from the opening for a door or window an effect in re-lief, due to the method of giving to them an enclosure with form suited to the projection, a lateral extension of the li-ntel or support, sometimes a crowning by a high cornice.(19; 20; 48). If this concerned a portal, to it was imparted a

form truly monumental in piercing the opening in a great facade, sometimes fashioned in the shape of a tower enhanced by a cornice, sometimes according to the arrangement -- known u under the name of pylon -- of a screen flanked by two high t towers. (32).

84 The Bortico.

In contrast to the massiveness and monotony of the external aspect, the enclosure of a court was almost always richly modeled in porticos.(51; 65). The arrangement of these comprised great diversity. Sometimes -- thus at the funerary Temple of Seti I at Kournah -- the colonnade was limited to one of the sides of the parallellogram; sometimes -- as in the s-second court of the Temple of Luxor -- it was developed on t two of them, sometimes on three -- as on the Temple of Khons at Karnak; finally, it sometimes extended around the entire perimeter, like the first court of Luxor. There was again diversity in regard to depth; one portico was single and another doubled; sometimes the same court -- the second one of the Ramesseum presents an example -- combined the use of both types.(28 - 30; 33, 36).

85 Limited by the span of the stone slabs, the mode of covering imposed by the ceiling and retained by prudence, Egyptian architecture realized only rather narrow intervals between c columns; in the central aisle of the columnar hall of Karnak, they do not attain two diameters, and in the side aisles, they scarcely exceed one; in the rear portico of the second court of the Temple of Medinet-Habou, they are inferior to the width of the bases! It is again proper to note that from the time of the XIX dynasty -- as proved by an example recorded at the Ramesseum by the scientists of the expedition to Egypt -- and currently in the Ptolemaic epoch -- as at Dendera, Edfou, the portico of Nectanebos in the island of Philae, etc. -- prevailed the mode of closing the intervals by a parapet crowned by a cornice, sometimes extending to mid-height.(36).

V. Effect by Relief in Details.

The various forms impressed by Egyptian art upon the isolated support merit attentive study, first on account of their diversity and of their esthetic quality, as well as for the

fact that they open gloriously, with an advance of at least two thousand years, the series of satisfying realizations of this architectural member.

From the day when it produced stone construction, Egypt employed both the pier and the column, but with a very marked preference for the second. We shall successively examine the varieties of both, taking care to make their origins and evolution manifest.

The Pier.

Doubtless men commenced with the pier of square section, t the most easily realized of the forms of this type, when it was required underground to leave a portion of the rock, or above ground either to erect a monolithic shaft or a series of courses. As examples may be cited those presented at an interval of long ages by the "Granite Temple" and the little peripteral Temple of Elephantine.(52).

At an early date -- proved by many tombs from the beginning of the Ancient empire -- the necessity of ensuring to the foot a firm bearing determined the addition of a base; an illustrious example of this improvement, dating from the first half of the 16 th century, is seen in the part of the Temple of Karnak termed the "Walk of Thoutmosis III".

86 The piers of the "Granite Temple" are perfectly plain. But in all times for that excessive simplicity, the programmes s substituted a decided search for effect; for the least, that of a painting or of a carving,(53), and as much as possible, that of a sculpture. Sometimes this was reduced to the execution of a motive in low relief, such as those images of lilies and of papyrus, that are shown at Zaouyet-el-Metein by a tomb of the VI dynasty, and at Karnak by two isolated supports in the court of Thoutmosis III (52, 3); sometimes in the funerary temples of the Pharaohs -- for example, those of Medinet-Habou or of Ipsamboul (35; 54), projecting in the round or in very high relief from the front face of the pier, was a colossal statue of Osiris or of a sovereign under the attributes of that god; or again -- so at El Kab -- on the upper part of the pier was placed a mask of Hathor; or finally -- Karnak exhibits a specimen whose elements date from Amenophis

87 II -- a sort of capital springs on each of the four surfaces by a wall cornice.(53). The idea of this last addition must have come to Egyptian architects from the sight of posts surmounted by blocks, used in the quarries of Egypt for supporting the ceiling of the gallery; may not the relief effect of the subterranean tombs of Beni-Hassan have been required in the image of the sheathing of a mine?

Yet the defects of the rectangular form, that interferes w with passage and the view, must have early determined the removal of the angles.(52, 6,-10). Thus resulted a polyedric type with eaght sides, which a repetition of the already indicated procedure transformed into a shaft with sixteen surfaces; examples are found dating from the Middle empire in the necropolises of Beni-Hassan and of Assouan, and in what remains of the structures of Ousirtasen at Karnak, while others are contemporary with the New empire in the portico of Anubis, in the Temple of Deir-el-Bahari, the creation of Thoutmosis III and of Amenophis II. The square head was retained to facilitate the reception of the beam, while the foot rested on a disk of small thickness. A happy innovation was doubtless suggested by the desire of accenting the relief, and consisted in hollowing a channel in each side; the analogy of the resulting appearance to that of the shaft of the Grecian column of the Doric order explains the designation of "Protodoric" applied to it by Champollion.(52, 8). The period of the New empire was not so well inspired, when impelled by the need of surfaces susceptible of illustration, it conceived the reservation vertically below one, two, three or all surfaces of t the rectangular top of these piers, of a band more or less wide, descending more or less low, often to the foot of the
88 shaft; such may be seen in a Temple of Amenophis III at Eileithya (El Kab), in the subterranean Temple of Beit El Ouali, the work of Ramses II, and in the Temple of Kalabsche of the Roman period.(52, 10).

The Column.

But with regard to the effect, the polygonal pillar cannot rival the column, by so much less that the Egyptians loved impressions of picturesque nature, as we have observed. Indeed they conformed the isolated support to the image of actu-

[illegible]
ed be referred by reason of variations of structure and of struc-
tal outline. Very observant and lovers of nature; further --
as we have found repeatedly -- successfully impressed by the
beauty of the local landscape, they took as models the types
[illegible]
for decorative use, -- those of the lotus, papyrus and date.
A little wooden column, much employed for the light architect-
ure of kiosks and shrines, of which actual specimens are lo-
[illegible]
or less embellished, consisted of a very slender stem like a
[illegible] decorated at the top by a capital either in the form of
a flower, closed or opened, or of a bouquet, or even of sev-
eral of these motives in succession; this decoration was some-
times often wrought in metal (...).

[illegible]

[illegible] form of cluster of lesser columns [illegible] capital
[illegible] and without ornament; a shaft [illegible]
[illegible], according to the [illegible];
a capital; finally in the shape of vertical columns, which in [illegible]
of its greatest development extends very little beyond the
perimeter of the capital, and is often reduced to the propor-
tions of a [illegible] invisible to the observer.

[illegible] at the present state of science permits us to go back, perhaps to the time of the V dynasty, we verify the simul-
[illegible]
[illegible]
[illegible] dominated by the distinctive influence of the [illegible] of the lotus, the papyrus or the date.

The Column of Lotus Form.

The column of lotus form is characterized by borrowing the form and details of its capital from the bud or flower of a variety of lotus, designated by the name of "Nelumbo lotus"(56).

The most ancient example of it was discovered at Abousir in a [illegible] from the V dynasty, that of a [illegible] named Ptah-shepses. The shaft imitates a bundle of cylindrical stems to the number of six, each of the [illegible] closed buds [illegible]
[illegible]

actual plants -- reeds, trees and flowers -- to which it could be referred by reason of analagies of stature and of general outline. Very observant and lovers of nature; further -- as we have noted previously -- necessarily impressed by the aspect of the local landscape, they took as models the types most familiar to theis eyes, -- otherwise entirely appropriate for decorative use, -- those of the lotus, papyrus and palm.

89 A little wooden column, much employed for the light architecure of kiosks and shrines, of which actual specimens are lacking, is known to us by numerous representations, indeed more
90 or less embellished, consisted of a very slender stem like a reed decorated at the top by a relief either in the form of a flower, closed or opened, or of a bouquet, or even of several of these motives in succession; this decoration was doubtless often wrought in metal (55).

An Egyptian column always superposes four elements; a circular base of greater or lesser thickness, but always rather thin and without ornament; a shaft with diameter diminishing upwards more or less, according to the orders or the periods; a capital; finally an abacus of variable height, which in case of its greatest development extends very little beyond the perimeter of the capital, and is often reduced to the proportions of a block invisible to the observer.

So far as the present state of science permits us to go back, perhaps to the time of the V dynasty, we verify the simultaneous existence of three principal types, between which was divided the favor of Egyptian architecture, and which are respectively denominated by the distinctive appearance of either the lotus, the papyrus or the palm.

The Column of Lotus Form.

The column of lotus form is characterized by borrowing the form and details of its capital from the bud or flower of a variety of lotus, designated by the name of "Nymphea lotus"(56).

The most ancient example known was discovered at Abousir in a mastaba dating from the V dynasty, that of a man named Ptah Schepses. The shaft imitates a bundle of cylindrical stems to the number of six, held at the top by five closed bands; below this collar the grroves between the stems are partly f

[illegible] or wall seems apparently kept in place by by the obst-
ance of the bands. [illegible] and band with bevelled edge, the ob-
[illegible]
[illegible]
uses that of a [illegible] lotus flower, stands in a corner as a
new [illegible] as these are of [illegible] and small stems in the [illegible]
The imitation is rather realistic, carefully distinguishing
the petals and sepals, and accenting the relief without omit-
ting to indicate the longitudinal stripes shown by the model.
Set on the top of the column and not projecting beyond it is
a [illegible] abacus block (Fig. [illegible]).

The volume of the order under the Middle Empire is attained
by the actual or [illegible] specimens shown by the tombs of B-
[illegible]
cing that it comprises more conventional details in the inter-
pretation of the floral motive, an enormous diminution of the
thickness of the stems and a slight increase in its horizon-
tal dimensions. The proportions are similar, the ratio of t
the lower diameter of the shaft to the total height including
the base being 1 to 7.(55, 4).

The column with lotus bud appears to have been obtained by
the art of the New Empire. It received favor again in the S
Ptolemaic epoch, but under a form modified by lowering the b
band and constriction of the capitals in the mass of a cylinder.
A good example of this type is to be seen at the Temple of
[illegible]

Of the type of capital in form of the expanded flower, we
possess for the Pharaonic period only representations (56, 6,
9). These teach us, that aside from the different details,
it does not differ from the column just described. On the c
contrary, the Ptolemaic epoch, notably at Edfou, presents ex-
amples showing an excessive multiplication of secondary moti-
ves and the enclosure of the whole within a cylindrical env-
elope. In all cases the abacus is reduced to the dimensions
of the shaft; covered by the projection of the bell, it has no
function other than to receive the load of the beam.(55,10).

The Column of Hathor Form.

Similarly more brilliant was the fortune of the column of

filled by small stems apparently kept in place by by the pressure of the bands. Broad and thin with beveled edge, the base evedently represents the ball of earth swelled by the packet of the roots. The capital, whose general outline reproduces that of a closed lotus flower, groups in a bouquet as m many buds as there are of large and small stems in the bundle. The imitation is rather realistic, carefully distinguishing the petals and sepals, and accenting the relief without omitting to incise the longitudinal stries shown by the model. Set on the top of the bouquet and not projecting beyond it is a pretty thick block.(56, 3).

The vogue of the order under the Middle empire is attested by the actural or figured specimens shown by the tombs of Be-
91 ni-Hassan and of El Bersheh. The formula is the same, excepting that it comprises more conventionalization in the inter-
pretation of the floral motive, an enormous diminution of the
92 thickness of the abacus and a slight increase in its horizontal dimensions. The proportions are slender, the ratio of t the lower diameter of the shaft to the total height including the base being 1 to 7.(56, 4).

The column with lotus bud appears to have been disdained by the art of the New empire. It received favor again in the P Ptolemaic epoch, but under a form modified by lowering the b band and concealment of the bundle in the mass of a cylinder. A good example of this type is to be seen at the Temple of Isis at Philae.(56, 7).

Of the type of capital in form of the expanded flower, we possess for the Pharaonic period only representations (56, 8, 9). These teach us, that aside from the different capital, it does not differ from the column just described. On the c contrary, the Ptolemaic epoch, notably at Edfou, presents examples showing an excessive multiplication of secondary motives and the enclosure of the bundle within a cylindrical envelope. In all cases the abacus is reduced to the dimensions of the shaft; masked by the projection of the bell, it has no function other than to receive the load of the beam.(56,10).

The Column of Papyrus Form.

Singularly more brilliant was the fortune of the column of

papyrus form, whose most ancient known application is seen in the funerary Temple of Neoserre (V dynasty) at Abousir.(58).

The plant which served as a model is a reed (Cyperus papyrus). The stem, whose section represents a triangle with convex sides, emerges from a sheath of lanceolate leaves and flowers in an umbel of varied profile, according to the phase of its development, from that of an elongated acorn to that of a bell widely opened at top. Like its rival lotus column,
93 the papyrus column comprises two variants, according to whet-
94 her its capital imitates the closed or expanded flower of the plant.

The general formula furnished by the papyrus bud appears closely related to that, which interprets the lotus under the same aspect; for in both are recognized the same divisions, the same essential elements, the same treatment of the modeling, and the same conception of the effect. Yet they are distinguished by differences, some of which are considerable. In a general way, such as appears in the time of the XII dynasty at Bubastis, Haoura, in what remains of the funerary Temple of Amenemhet III, are more in relief and more picturesque.(58, 3). The base loses width and gains height; the shaft presents an outline with movement as a result of a reduction of its lower part, giving it a very pronounced bulbous form, exactly the appearance of a tuft issuing from a single base; an appearance so much more apparent since the bottom of each stem is ornamented by a carved representation of the lanceolate leaves otherwise sheathing the base of the model plant. At the same time, the circumference is accented by the substitution of a pointed section with sharp edge for the semicircular section of the stems of the lotus bundle. From that m modification results an emphasis on the shades, that strengthens the sculptured effect; to which also energetically contributes the darker zone at the reduction of the foot of the shaft.(57).

Yet there was early a marked tendency to obliterate the original appearance of the order, both by a multiplication of the elements of the bundle and by an increasing conventionalization of forms, at the expense of the relief and of truth

... Thebes, it was the successor transformed by the rulers of Thebes and by those of Memphis exhibit a fascicle and a column composed of eight units. Likewise for the secondary divisions inserted in the grooves of the shaft and under the bulbs; the lotus column, and they are arranged within the band of filleted annulets; at the same time their projection diminished at the same time they are enlarged. This mode created under the New empire, as it appears in the colonnades of the outer hall and of the peristyle court of the Temple of Luxor and of that at Soleb, both works of Amenophis III. tures.(?); 80, 81).

The abandoning of the forms just noted was precipitated in the time of the New empire by the necessity found by the architects in the numerous productions, too considerable and ... of the stone, of substitution for granite and fine limestone of sandstone, which is less susceptible of sculpture; finally to furnish the greatest and the smooth surface for reliefs. At Deir el Bahari, the new school was not contented with enclosing outlines of the stems; they conceived these as bound to the cylindrical shaft at four or five places and covered with a painted or sculptured ornamentation.(75,10). The transformation of the bundle into a shaft and of the bouquet into a calyx, both equally smooth, was consummated at the epoch of the XIX dynasty, when to the causes previously mentioned came to be added that of creating the increased dimensions of columns; reducing the visibility of the upper parts and exhibiting refined sculpture.

... of Thebes, created a column with cylindrical shaft and with a truncated cone as capital,—which soon triumphed at Karnak in the lower aisles of the columnar hall and in the Temple of Gurna, as well as in the Temple of Rameses III at Medinet-Habu.(?,71). Of the primitive type there remains then but the general outline; it is still affected by the modificatio-

in imitation. Thus the specimens furnished by the ruins of Bubastis and by those of Haoura exhibit a bundle and a bouquet composed of eight units. Likewise for the secondary plants inserted in the grooves of the shaft and under the collar; their number is thrice that comprised in the arrangement of the lotus column, and they are cramped within the band of five joined annulets; at the same time their projection diminishes; engraving tends to replace relief; finally, they are flattened at the same time they are enlarged. This mode persisted under the New empire, as it appears in the colonnades of the columnar hall and of the peristylar court of the Temple of Luxor and of that at Soleb, both works of Amenophis III. The proportions remain elegant, the total height containing the greatest diameter of the shaft a little more than five times.(57; 58, 6).

The smoothing of the forms just noted was precipitated in the time of the New empire by the necessity found by the architecture in too numerous productions, too considerable and t too hasty, for sacrificing the effect of the details to that of the whole, of substitution for granite and fine limestone of sandstone, which is less susceptible of sculpture; finally to furnish the engraver and the scribe the most plain surface possible. At Tell el Amarna, the new school was not contented with enclosing bundles of 32 stems; they conceived these as carved in the cylindrical sheath at four or five places a and covered with a painted or sculptured ornamentation.(56,10). The transformation of the bundle into a shaft and of the bouquet into a calyx, both equally smooth, was consummated at t the epoch of the XIX dynasty, when to the causes previously mentioned came to be added that creating the increased proportions of columns; reducing the visibility of the upper parts and excluding refined sculpture.

From the reign of Seti I, as shown by his funerary Temple at Kourna, appeared a column with cylindrical shaft and with a truncated cone as capital, which soon triumphed at Karnak in the lower aisles of the columnar hall and in the Temple of Khons, as well as in the Temple of Ramses III at Medinet-Habou.(58,7). Of the primitive type there remains then but the general outline; it is still affected by the modificatio-

modifications of the profile of the abacus and of the base; increased height of both, reduction of the surface of the second and a rounding of its bevel.

The proportions tend to become heavy; the columns of Kourna and those of the lower aisles of Karnak only measure a little over four and a half diameters in height, those of Medinet-Habou only four.

Yet the memory of the original forms is practically retained by the engraved representation of a fivefold band at the top of the shaft, by the painted representation of the bands of the little bouquets, complementary to the principal one, and finally by the lanceolate leaves at the bottom of the bulbous shaft.

The archaizing tendencies of the Saitic and Ptolemaic periods appear to have restored to honor the fashion of the bundle shafts and of capitals in form of a bouquet of buds. But the examples to be seen at Achmounein (Hermopolis magna) and Medamout, north of Thebes, betray a shocking misunderstanding of the effect of a column, since the impression of growth is contradicted by the repetition of the enclosing collar at three places with equal intervals.

The type of the capital of the papyrus column, in the image of the expanded umbel of the plant, is often designated by t the term bell-shaped, on account of its resemblance to a bell with its opening upwards. It did not appear, -- at least in the actual state of that known in historic times, -- before the period of the Middle empire, to which belong the specimens discovered at Kahaun and the representations visible in a tomb at El Berscheh.

In any case a single flower sufficed to compose the motive, just as the shaft represents a single stem, although for the reason of appearance was retained the collar of the bands.((58, 8 - 11; 59). The Ptolemaic and Roman epochs conceived a hybrid type, of which characteristic specimens are seen at Philae and Edfou; below the bands, whose place is lower than ordinary, the shaft is cylindrical; above it is conformed to a bundle of slender stems and is crowned by a bouquet with inserted flower stems. The abacus is narrow and is entirely

masked by a corolla. The relative realism of the ornamental
conception of this order is manifested by the representation
of the sheath of lanceolate scales characteristic of the base
of the plant, of sepals beneath the umbel, and finally by the
radiation of the needles composing that. Yet it is a fault
contrary to the actual appearance in imposing the bulbous sh-
ape at the bottom of the shaft indicating a single reed and
no longer a bundle, for example to be observed at the Ramess-
eum. It is a defect in taste in the vertical development of
the abacus of the capital to the proportions of a prism, and
the accenting of its appearance by the sculpture on its faces.
Philae presents an example of this treatment, contemporary
with the decline of the school.(58, 12, 13).

The papyrus column with umbel or bell was in vogue under t
the New empire, notably from the XVIII dynasty. It was part-
icularly employed to support the central nave of columnar ha-
lls, which was higher than the others for practical reasons.
Hence its relative slenderness in height, being more than six
diameters; its diminution so reduced as to be scarcely percep-
tible to the eye.(58, 11; 59; 31).

The Palm Column.

In all periods a third type of column in form of a palm was
concurrent with those just presented; it appeared from the t
time of the V dynasty in the funerary Chapel of the Pharaoh
Ounas; it retained the favor of the Middle and New empires,
as proved by the beautiful examples to be seen on the one ha-
nd at Bubastis, at Heracleopolis magna, and especially at El
Berscheh (61, 2), on the other in a Temple of Amenophis III
at Soleb (61, 5) and in the Palace of Amenophis IV at Tell
el Amarna; finally its vogue during the Ptolemaic and Roman
epochs is attested by the ruins of Philae.(61, 7; 60).

Its form repeated the characteristic traits of its model,
the date palm. The shaft was cylindrical, which did not pre-
vent enclosing it at top by five bands, as if it had been com-
posed of a bundle; an anomaly explained, both by analogy and
by the desire to accent the necessary separation of the two
elements of the column. The late period moved this collar m
more or less downward to give place to a representation of t
the scales on the trunk of the tree. The capital imitated a

[illegible]
[illegible] of which in late examples are representations of leaves. The bell greatly exceeds the shaft.

The height varies according to the periods; at first particularly slender -- at [illegible] constituting six diameters, it becomes heavier under the New Empire -- at [illegible] not exceeding [illegible] [illegible] they seem to be a law common to the two orders obviously [illegible]: they are heavier and thicker as they are later.

The Hathor Column. -- The Composite Column -- Differentiation.

[illegible] and Roman periods.

The Hathor column (72) presents the emblem and conventionalised image of a sistrum, a musical instrument used by the [illegible] scenes of prayer and sacrifice, [illegible] explains the fact, that this form of support [illegible] edifices consecrated to [illegible] [illegible] wide and divided into two stories, the faces of which at first, and later all four, were sculptured; a mask of the [illegible] [illegible] on which was superposed an [illegible] of the [illegible] of the instrument [illegible] by two volutes recalling the vibrating parts of the instrument. Applications of this formula are known dating from the Middle Empire, for example at [illegible] in the structures of Usertesen III (XII dynasty); there exist very good [illegible] with the XVIII dynasty at Karnak, Deir el Bahari, in the temple erected by [illegible] at Sedinga [illegible] but [illegible] was the product of the school in its decline, especially notable in the [illegible] vestibules of the temples of Hathor at Dendera and at Philae.

On the whole the Composite Order, which originates at [illegible], Dendera and Philae, [illegible]

sheaf of palm leaves to the number of eight to ten, at the springing of which in late examples are represented bunches of dates. The bell greatly exceeds the abacus.

The height varies according to the periods; at first relatively slender -- at El Berscheh containing six diameters, it became heavier under the New empire -- at Soleb not exceeding
99 five diameters, to resume its primary slenderness in the Ptolemaic epoch. As for the proportions of the base and abacus, they submitted to a law common to the two orders previously studied; they are narrower and higher as they are later.

The Hathor Column. -- The Composite Column -- Different Types.

In sequence to the three types that we have just surveyed should rank some others more seldom employed, such as the Hathor form and the Composite column, favored by the Ptolemaic and Roman periods.

The Hathor column (62) presents the enlarged and conventionalized image of a sistrum, a musical instrument used by the Egyptian women, and which particularly the queens held in the scenes of prayer and sacrifice; this explains the fact, that this form of support appears only in edifices consecrated to female deities. Like the handle of the sistrum, the shaft w was cylindrical. The capital was formed of a prism twice as high as wide and divided into two stories, two faces of which at first, and later all four, were sculptured; a mask of the goddess Hathor in high relief was generally crowned by a cornice, on which was superposed an image of the body of the instrument under the appearance of a sort of chapel facade flanked by two volutes recalling the vibrating parts of the instrument. Applications of this formula are known dating from the Middle empire, for example at Bubastis in the structures of Ousirtasen III (X99 dynasty); there exist many contemporaries with the XVIII dynasty at Karnak, Deir el Bahari, in the
100 temples erected by Amenophis III at El Kab and at Sedinga near the third cataract; but most are the product of the school in its decline, especially notable in the portico vestibules of the Temples of Hathor at Dendera and at Philae.

On the whole the Composite order, which triumphs at Edfou, Kum Ombo and Philae, strongly resembles the papyrus column w

the lee ... of ... part. But it differs in the addition of a
its central which imitates a basket -- ... over palm-
[illegible]
... was very picturesque. ...

The abacus is often excessively developed in relief and in-equality receives on each side an image of Hathor or that of a sistrum.(86).

Finally, it is necessary to cite some exceptional forms: a one type is otherwise incorrectly shown by fragments found I in the ruins of the palace of Tell el Amarna, etc. is characterized by a shaft in the image of a bundle of very reeds circled by rings; another from the same source imitates a trunk enclosed by a climbing vine; finally a third, to be seen in the hall of Thothmes III at Karnak, at first sight seems as an inversion of the campaniform order, its shaft being a [illegible] cular collar and its capital resembling a bell in its normal position; it ... as the translation into stone of a wooden post, numerous representations of which have been preserved to us in the paintings, without mentioning that one recognized in abridged form in the ... site for the ... (87)

In brief, the columns of the varieties of isolated supports just analyzed appear essentially picturesque, conceived to please the eye and interest the mind by the abstraction of [illegible] of ingenious transpositions and strict conventionalization. [illegible] the function of the structure. And their form is quite free and harmonious, so that the general appearance is very happy, assuring to the inventions of Egypt a place of honor in the series of universal art.

II. Effects of Ornamentation.

As all ... of its career and more and more as it became [illegible]

with open umbel, presenting its general outline and reproducing its shaft and base. But it differs in the modeling of i its capital which imitates a basket -- frequently overloaded -- filled with flowers and fruits, and which, subjected to t the criticism of a severe taste, is still picturesque and sometimes very pleasing.(63; 65).

The abacus is often excessively developed in height and frequently receives on each side an image of Hathor or that of a sistrum.(65).

101 Finally, it is necessary to cite some exceptional forms; o one type is otherwise imperfectly shown by fragments found i in the ruins of the Palace of Tell el Amarna, and is characterized by a shaft in the image of a bundle of many reeds connected by rings; another from the same source imitates a trunk enclosed by a clinging vine; finally a third, to be seen in the walk of Thoutmosis III at Karnak, at first sight appears as an inversion of the papyrus umbel, its shaft being a truncated cone inverted, otherwise being provided with the regular collar and its capital resembling a bell in its normal position; in truth it realizes the translation into stone of a wooden post, numerous representations of which have been preserved to us in the paintings, without mentioning that one recognized in abridged form in the hieroglyphic sign for the object.(64).

In brief, the sculptures of the varieties of isolated supports just analyzed appear essentially picturesque, conceived to please the eye and interest the mind by the attraction of a naturalism tempered by the imagination and by the interest of ingenious transpositions and skilful conventionalization. Doubtless they are affected by some structural and decorative inconveniences, yet their appearance sufficiently expresses the function of the structure, and their form is quite free and harmonious, so that the general appearance is very happy, assuring to the inventions of Egypt a place of honor in the series of universal art.

VI. Effects of Ornamentation.

At all epochs of its career and more and more as it became older, Egyptian architecture showed a weakness for the adven-

102 adventitious effects produced by the beauty of the materials, by polychromy, and for decoration by ornaments or figures.

Effects of the Materials.

When the means did not permit building with choice materia-
ls, recourse was had to the artifice of a facing. From prot-
ohistoric times this practice appears in a paneling of slabs
on the walls of the sepulchral chambers, and in a coating wi-
th white clay or plaster. Later for an important monument,
if the resources sufficed, they did not fail to incur the co-
st of a facing of choice stone, polished perfectly so as to
reflect the dazzling light of the Egyptian sky. Thus the gr-
eat pyramids of Gizeh were entirely covered with the finest
Mokattam limestone, excepting the base, that was girdled with
103 granite; so at Dachour the brick pyramids of Ousirtasen III
04 and of Amenemhet III bore a covering of stone; likewise again
were lined the great gallery of the Pyramid of Cheops with c
choice limestone and the funerary chamber with granite; the
interior of the Tomb of Neouserre at Abousir with black basa-
lt, etc.

commonly and particularly under the New empire was employed the more economical procedure of a coating of stucco carefully smoothed, which further presented the advantage of facilitating the execution of reliefs and engraving, appreciated by a civilization loving luxury and interested in images. For modest brick structures, they were contented with a coating of white mud.

By taste and also because the programme of a temple or tomb necessarily comprised a considerable quantity of images and of inscriptions, Egyptian architecture under the New empire came to decorate all available surfaces, whether belonging to a column or wall, to a ceiling or the pavement, and whether external or internal. Happily the defects resulting from such prodigality were largely reduced by certain peculiarities of expression in relief of Egyptian art, such as a very decided summary presentation of the rendering, a coloring by flat tints, a processional composition, a perspective by superposed figures, all more or less excluding a realistic appearance and producing the effect of tapestry rather than of a painting.

The mode of execution of the ornamentation was most frequently engraving or mural painting (31; 37; 44; 66); quite commonly a sunken outline in the surface around the motive in r relief (67); more rarely sculpture in very low relief.

Effects of color.

Whether external or internal, the decoration essentially c comprised a color effect. Externally this was indispensable for giving body to the edifice, whose forms tended to vanish under the radiation of a blinding light, as we have observed, and whose outline is often badly detached from the background of rocks or of brilliantly illuminated sand. Internally it rendered the service of warming and enlivening the gloom of the porticos and columnar halls, as well as the obscurity of the sanctuaries. Egyptian architecture had the merit of comprehending the equal necessity in both cases for seeking ric-
105 hness of color and high tone; for contrasting the parts and for arranging simple and free harmonies, finally to realize accord of colors with the degree of lighting and with the destination of the place. Skilful in the preparation and application of the materials, versed in the knowledge of the relations of colors, the decorators employing them have created models of monumental illumination.[1]

Note 1. Their palette was particularly charged with blue and then with red; afterwards came yellow, green, black and white.).

Their means varied: painting, applications of metal, incrus-
106 tations, and enameled facings.

Executed with white of egg or gum, sometimes by a wash, sometimes by applying spots and lights, Egyptian decorative painting is as remarkable for its adhesion to the ground and by the permanence of its pigments, as by the beauty and vigor of its coloring.

Metal was utilized as coverings of copper, overlays of bronze, gilded or plain, or as gilding placed on projections or in hollows.

Polychromy by incrustation on stone, stucco or cement was much appreciated; the filling materials were plaster, bits of stone, or even colored glass pastes. Thus at the ruins of

[illegible] of Tell el [illegible] were inlaid in white limestone, [illegible] in rolling [illegible], [illegible] or red stone; in red granite, alabaster, in [illegible] stone, blue and red [illegible].

[illegible], [illegible] were employed. The [illegible] the chambers of the step-[illegible] at Saccara (III dynasty) was faced with rectangular plaques, slightly convex on their [illegible] surfaces, [illegible] the [illegible] of [illegible] blue, red, yellow or green for the [illegible] or inscriptions. The [illegible] of [illegible] use of this [illegible] technique [illegible] in the course of Egyptian history is attested by [illegible].[1]

Note 1. Yellow and green bricks, stamped with the cartouche of Pepi I (?) and [illegible] tiles collected in the part of the [illegible] [illegible] found in quantity at Tell el Yahudiya, at the Temple of Ramses III at Medinet-Habu, and especially in an edifice built by [illegible] [illegible] [illegible] [illegible] [illegible] and glass [illegible].

[illegible] and Interpretation of Motives.

Consistent with regard to the choice and interpretation of [illegible] [illegible] [illegible] treatments of conventionalized natural [illegible] [illegible] to the [illegible] of the combinations, the [illegible] of the outlines, [illegible] [illegible] the lotus, [illegible] and lily, closed or opened, palm leaf, [illegible] and [illegible].

The [illegible] borrowed from the plant, animal or human reality [illegible] [illegible] [illegible] conditions, that [illegible] [illegible] of ornamentation; [illegible] in a very great measure of [illegible] [illegible] [illegible] and the [illegible].

[illegible] [illegible] [illegible] of nature or of the views of ordinary life [illegible] in [illegible] to the master of the dwelling; on [illegible]

the Palace of Tell el Amarna were inlaid in white limestone, black obsidian, red quartz and black granite; in yellow quartz, bits of black or red sorts; in red granite, alabaster, in natural stone, blue and red enamels.

Finally, glazed or enameled tiles were employed. One of t the chambers of the stepped Pyramid at Saccara (III dynasty) was faced with rectangular plaques, slightly convex on their visible surfaces, whose ground tint was green or brown with blue, red, yellow or green for the hieroglyphs or inscriptions. The constancy of the use of this precious factor of polychromy in the course of Egyptian history is attested by numerous articles.[1]

Note 1. Yellow and green bricks, stamped with the cartouche of Pepi I (VI dynasty); tiles collected in the part of the Temple of Karnak erected by Amenophis I; various fragments f found in quantity at Tell el Amarna, at the Temple of Ramses III at Medinet-Habou, and especially in an edifice built by the same prince at Tell el Yahoudieh, north of Cairo, and in the ornamentation of which were substantially employed together ceramic plaques and glass pastes.

Selection and Interpretation of Motives.

Considered with regard to the choice and interpretation of the motives, Egyptian architectural decoration exhibits a taste for geometrical arrangements of conventionalized natural motives. It derived the happiest effects from these, thanks to the charm of the combinations, the freedom of the outlines, the rythm of the arrangement, the richness or the harmony of the polychromy. Its favorite elements were the flowers of the lotus, papyrus and lily, closed or opened, palm leaf, rosettes and scrolls.(68; 69).

The themes borrowed from the plant, animal or human reality reveal both this acceptance of the natural conditions, that we have mentioned several times, a very naturalistic conception of ornamentation; finally in a very great measure of feeling for adaptation to the place and the purpose.

In an interior these were charming, cheerful and diverting, recalling aspects of nature or of the views of ordinary life familiar and sympathetic to the master of the dwelling; on t

the pavement being images of water, ground, plants and fishes; on the bases of the walls were plants, animals and insects; on the upper surfaces of the walls being pleasing scenes of life.(70; 71).

The decoration of the tomb was carefully adapted to the needs as well as the beliefs attributed to its occupant. So 1 long as the life in the beyond was represented as a "double" of that here, this consisted of faithful representations of the conditions and characteristics of the terrestrial existence of the deceased, of the elements of his future, the signs of his social position, of his deeds and acts, useful or agreeable.

When the more spiritual conception of the migration of souls into another world originated in the time of the New empire, into the nocturnal habitation of the sun, there were represented the deities, genii of Hades, the stages of the solar
109 course, the wanderings and the gudgement of the shades.

110 There was no less fitness in the ornamentation of a temple, for this not only emphasized its purpose as the "house" of a god", but also the profound causes, conditions and circumstances of its erection; the humble and anonymous piety of the entire country, the devotion of a Pharaoh, the sole quelified intermediary between man and the deity, frequently the gratitude of a sovereign heard by Amon. The decoration of the interior tended to impress on it the appearance of a reduction of Egypt. Coated with blue, sprinkled with golden stars, the ceiling was properly a sky; above the middle aisle of a columnar hall appeared a file of vultures, which completed the resemblance and appeared to guard the way of access to the sanctuary (35; 72); in the Ptolemaic epoch, it was further animated by figures of deities and of the genii of the seasons, of the months and the constellations. That the pavement of a h hall was actually a part of the valley of the Nile was clearly announced by the columns in form of the lotus, papyrus and palm, and the images of indigenous plants arranged at the base of walls with the procession on the surfaces, of persons bearing offerings symbolizing the Nile and the provinces; finally in accord with the primitive political division of Egy-

Egypt into the two realms of the North and the South, the rule of contrasting a northern region dominated by the image of the papyrus, the heraldic emblem of lower Egypt, and a southern on which reigned the representation of the lily, the armorial sign of the upper country.(66). The other elements of the decoration were no less significant. On the facades of the monument and on the front of the pylons was the representation of the triumphs of Pharaoh, nowise out of place, since the sovereign thus attributed them to his celestial father; in those public portions of the interior were seen the ritual acts of the prince, expressing his relations with the gods a and the union of the two human and divine natures realized in him; finally in the proper dwelling of the god were only divine images; those of the master of the house, his relatives and his race.

Indeed the ingenuity of invention recommends many productions of Egyptian architectural decoration. Such as in the room containing a stairway in the Temple of Dendera giving access to the terraces, the representation of a procession ascending at one side and descending at the other; such again was the representation on the pavement of the passages trod by t the feet of Pharaoh, of sculptured of painted captives, as m may be seen at the threshold of a ruined edifice of the Ancient empire at Hieraconopolis, or in the central aisle of a hall of the Palace of Amenophis IV at Tell el Amarna.

[illegible] to present as a whole and almost [illegible]

[illegible] of the three countries, whi-

[illegible]

[illegible], and which [illegible]

[illegible]

[illegible]

[illegible]; the second, of the low and even marshy lands of the [illegible]

[illegible]

[illegible] of Iran; the third, of the districts [illegible]

[illegible] as far as the foot of the Arm-

[illegible]

three thousand years at least, the art of carving did not proceed everywhere and always in the same fashion. But throu- [illegible] we find almost [illegible] of the primitive climate [illegible]

[illegible] must have arisen at the same period the various [illegible], and in the course of time [illegible]

[illegible]; the schools [illegible]

[illegible] the [illegible] restrain[illegible]

[illegible], and many [illegible] were [illegible]

[illegible]

[illegible] in the vicinity of [illegible]

[illegible] in the same [illegible]

[illegible]

the same artistic family [illegible] the ruins of [illegible] and [illegible]

of Nineveh and the second [illegible].

112 Section II. Architecture in Mesopotamia.

It is expedient to present as a whole and almost on the sa-
me plane the architectural works of the three countries, whi-
ch in the ancient history of the East respectively bear the
names of Chaldea, Elam and Assyria, and which consist of:--
the first, of the plains watered by the Euphrates and the Ti-
gris from the point at which these streams approach each oth-
er; the second, of the low and even marshy lands at the east
of the Chatt el Arab with the stepped terraces as far as the
mountains on the border of Iran; the third, of the plateaus
rising at the north of Chaldea as far as the foot of the Arm-
enian mountains.

Necessarily over so considerable an extent and in the cour-
se of a history, whose revelations are scarcely touched by e
excavations, but which permit its duration to be estimated at
three thousand years at least, the art of building did not p
proceed everywhere and always in the same fashion. But thou-
gh we know almost nothing of the primitive Elamite production,
that we have only a glimpse of the Chaldean, and that the As-
syrian is yet far from having yielded us all its secret,[1] a
close relationship must have united at the same period the v
various architectural styles, and in the course of time the
different ages of their development; the schools were adjace-
nt, subject to even the same physical restraints, influenced
by similar customs, and many times were approximated by the
grouping of the country under the same authority; on the oth-
er hand in those regions civilization is so traditional, that
today in the vicinity of Khorsabad the masons build in nowise
113 different from their predecessors in the same places twenty-
six centuries ago! In truth, in spite of the hundreds of mi-
les and the dozens of centuries separating them, to one and
the same artistic family belong the ruins of Warka and Tello,
of Niniveh and the second Babylon.

Chapter 1. Requirements. -- Monumental Chronology and Topography.

I. Requirements.

At an early date -- at least from the beginning of the third thousand years before our era, and doubtless much earlier, -- Mesopotamia realized the primary condition of artistic activity, material prosperity.

To the considerable fixed revenues of the sovereigns were frequently added extraordinary resources, the result of the policy of conquest and of forays to which they were accustomed. Invested with absolute power and endowed with a semi-divine quality by the credulity of their subjects, they spared nothing to ensure to their sublime dignity the appropriate setting of magnificent residences, not slight and perishable like those of the Pharaohs, but solid and strong, each one p placing his self-love on possessing one or several, which should form the measure of his glory and should eclipse those of his predecessors. In truth, it was to house and protect them, which especially occupied the architecture of Mesopotamia.

On the contrary, the private demand always remained secondary. As still today in the same places, the rural habitation was nothing more than a miserable cabin, when it was not reduced to a hut of reeds, and if the city dwelling comprised a certain comfort and no luxury, it was never monumental.

In absolute contrast to that of Egypt, the civilization of Mesopotamia never created a funerary architecture at all. C Commonly the corpses were interred in the earth beneath the houses, or they were placed in coffins of terra cotta. Rarely were they deposited in small brick vaults, of which Elam and lower Chaldea present examples; more frequently were constructed common cemeteries -- such as those of Warka, Mougeir and Sourghoul in lower Chaldea, by heaping on a platform terra cotta coffins connected together by a layer of earth and bricks.

The religious requirement in Mesopotamia lacked greatly in comparison with what we have noted in Egypt. Doubtless the deities there were numerous and were revered, and the kings

voluntarily proclaimed themselves as their submissive vassals, their "agents in charge", and never failed to mark their devotion by the erection of new sanctuaries and the restoration or embellishment of ancient ones. Yet if it be compared with its rival on the banks of the Nile, the architecture of Mesopotamia appears to have received neither such frequent appeals, nor in particular programmes so ample and so capable of inspiration.

II. Monumental Topography and Chronology.

In its present state, the history of the architecture of Mesopotamia can be distinguished in a primitive epoch corresponding to the third thousang years B. C. The evidence is:-- in upper Chaldea, the remains of the great Temple of Bel at Nippur, in part contemporaneous with the 25 th century B. C. and partly earlier, and those of the Sanctuary of Sippara at the place now called Abou Habba near Bagdad, which date from the end of the third thousand years; in lower Chaldea, at Mougheir -- anciently Ourou -- and at Warka -- formerly Ourouk, -- at Abou Sharein -- site of ancient Eridou, are remains of temples, and at Tello -- called Lagash -- are important ruins, which even take us back to the 28 th century, the most notable being those of the Palace of Goudea, prince of the locality about 2340 B. C.

The first destruction of Babylon by the Assyrians in 689 d destroyed the structures of the sovereigns, who from the time of Hammurabi (about 1950) had erected there many great palaces and many temples, "whose tops reached the sky", and we find any monuments only by coming down to the last third of the 12 th century B.C. and by passing into Assyria. They are presented to us in the city of Assour, which from the beginning of the second thousand years was the capital of a powerful k kingdom, and always remained the holy city of the empire, by the great Temple of the supreme god Assour, and by those of Anou and of Adad, creations of Tiglathphalasar I.

The best know phase of the architectural production of Mesopotamia extends from the beginning of the 9 th to the end of the 7 th century B.C. The elements are substantially furnished by the little remaining on the left bank of the Tigris op-

opposite Mossoul, of what was Nineveh before it was sacked by the Medes in 608. What has been discovered are the creations of a line of sovereigns, who are counted among the most powerful, the most magnificent, and the greatest builders in history, and are distributed between the three places; Khorsabad on the north, Koijoundjik in the middle, and finally toward the south in Nimroud -- now Kalakh -- at the junction of the Tigris and the Zab, where may be distinguished three palaces, respectively sitaated at the south~~east~~west, north and northwest.
116 The last commences the series, having been built by Assournazirpal, who reigned from 885 to 860. The hill of Khorsabad preserves the vestiges of the City and Palace of Dour Sharroukin, the work of Sargon, king from 772 to 705. Then comes at Koijundjik the residence of Sennacherib (705-681), that he erected with the enthusiasm and which seemed to him so beautiful, that he named it "the Peerless"; from the same reign d dates the erection of a "Palace for Festivals" consecrated to the god of Assour in his city. Then at Nimroud are the Southwest Palace and that of the North, the first devised for Asarhaddon (681-668), the second for Assourbanipal.(668-625).

The restoration of Babylon in 680 opened on the banks of t the Euphrates a great building locality, whose activity lasted until the destruction of the city in 519 by Darius, building its fill from 625 to 605 under the reigns of Nabopolassar (died 605), and particularly from 605 to 562 under Naboukodonosor, one of the best characterized among the princes impassioned with splendor and with building. The importance of t the effort is attested by the enormous size of the four hills of ruins named Babil, El Kasr, Tells Amrau and Djoum-Djouma, which at the noth of Hillah and on the left bank of the river, mark the site of the great city, and by those of the mound on the right bank, which contains the ruins of Borsippa, a satellite of the capital. The city was immense, its area exceeding 190 square miles; its ramparts were formidable; numerous
117 were the temples -- forty-three if the texts are credited -- four of which have recently been discovered; in the first rank that of Esagila, the house of Mardoux, the supreme god, e erected by Asarhaddon, enlarged and beautified by his succes-

successors; then those of Ninmagh and of Isntar, and at Borsippa that of Nebo, vassal of Mardouk; grand were the avenues; gigantic were the royal palaces, notably the three built by Naboukodonosor, one of them covering about 11 acres of the place called El Kasr, another furnishing the materials for t the hill of Babil, doubtless the same, whose lofty terraces were celebrated under the name of the "hanging gardens of Babylon".

Chapter 2. Natural, Human and Technical Conditions. Radiation of the Art of Mesopotamia.

I. Natural Conditions.

By reason of the physical conditions of its production, the architecture of Mesopotamia found itself opposed by several difficulties, some of which were quite serious.

A primary one resulted from the instability of the soil of the plains, saturated by water filtering in from the rivers and periodically covered by the floods of the Euphrates and the Tigris.

The climate required a rational adaptation of the plan and the construction to various and in part contrary peculiarities. As extremes it opposed dry and torrid summers to wet winters, windy and sometimes cold. From May and often from the middle of April until November uninterruptedly prevailed temperatures, which in the shade maintained an average of about 104° Fah., while the excess reached 122° Fah. Restricted to the winter season, the rains fell in heavy showers, that became deluges at the approach of summer.

With regard to materials, the architecture of Mesopotamia was not exactly spoiled by nature. Chaldea and lower Elam are entirely without stone; on the other hand the deposits of the rivers supply all Mesopotamia with a mud entirely suited for construction in clay.[1]

Note 1. The material of the bricks of Khorsabad, as reported by Place, is "compact, pliable and unctuous; its property of adhesion is very remarkable, and it is so plastic, that it cannot be better compared, than to potter's or rather to modeling clay."

Assyria possesses banks, which can be quarried under the open sky, of common limestone and of a sort of Gypsum alabaster of gray color with whitish spots, soft, easily polished a and carved, but resisting dampness but little. Bitumen springs everywhere and great reeds abound in the lowlands; as for wood, except on the highest parts of Elam and of Assyria, there is nothing more than the mediocre material of the palm.

Indeed the architecture of Mesopotamia could supply itself with materials from adjacent countries, lacking in its own; ordinary limestone, marble and hard stones in upper Syria;

diorite at Mt. Sinai and in Arabia; fir, cypress and cedar on the heights of Lebanon and of Amanus. So much better, as transportation was facilitated both by the existence of an extensive network of navigable streams, natural and artificial, and by human conditions found in those countries by the art of building.

119 II. Human and Technical Conditions.

These indeed compensated for the insufficient favors of nature.

The political administration of their peoples, the power a and wealth of their kings, placed almost unlimited resources and means of action at the disposal of the architects of Mesopotamia; multitudes of submissive laborers, national levies or prisoners of war, as well as enormous quantities of rare materials, the booty of campaigns, tributes of vassals and gifts of allies.

Construction in Mesopotamia must equally benefit by the taste and aptitude of the race for mathematical speculations, by the methodical bent of its genius, and by its industrial skill; it was early provided with metal tools,[1] with assured formulas and perfected processes, with an accurate and convenient system of measures, as well as the art of drawing plans at a scale.[2] Finally the masters of the works in Mesopotamia knew how to discipline labor, to organize the production and management of materials equally prodigious, and to coordinate the efforts of numerous gangs, among which the magnitude of the undertakings and the haste of the sovereigns forced them to distribute the demands.

Note 1. Elam and Babylonia excelled very early in the casting of bronze, and the excavations of Khorsabad have revealed, that in the 8 th century the use of iron was common.

Note 2. A seated statue from Gudea (about 2340) holds on its knees a tablet, on which is traced a plan of a fortified palace, and on it is placed a scale divided into 16 parts.

III. Radiation of the Art of Mesopotamia.

The influence of the art of Mesopotamia was immense and it survived the civilization, of which it had been a significant expression.

At first the political and economic expression of the various Chaldean and Assyrian empires, as well as the active export of the products of their industry by the Phoenicians, determined a wide diffusion of certain of its processes and of many of its decorative formulas in all western Asia, and in 120 the eastern basin of the Mediterranean. Egypt was itself affected after its Syrian campaigns had reduced its distance f from the country of the Tigris and the Euphrates.

Later the architecture of Mesopotamia furnished in large measure the elements, that constituted in the same or adjoining countries, those of the Persia of the Achemenides, of Parthia, of Persia of the Sassanides, and of Mohammedan Mesopotamia.

Finally, it influenced Chinese architecture, impressed the Roman school and exerted a strong effect on the development of Byzantine art.

CHAPTER II. [illegible] CIVILIZATION.

1. Civil and military architecture.

The city.

The civilization of Mesopotamia -- at least such as it appears to us in the course of the first thousand years B.C. -- [illegible] The streets of Assur were recently cleared up, were narrow [illegible] (Koldewey) were from [illegible] ft. wide; according to Herodotus, those of [illegible] formed a systematic network by the intersection of twenty-five avenues perpendicular to the river and of twenty-five parallel to the river, [illegible] by a bridge; [illegible] a sacred and richly ornamented avenue traversed the city leading to the Temple of [illegible].

[illegible]

Such as are preserved to us by the texts relating to Babylon, and are shown by the plan engraved on the tablet held by the statue of the patesi of Gudea [illegible] century), and by the remains of the wall of Dour Sharrukin (end of 8th century), fortifications in Mesopotamia manifest a remarkable skill in defence [illegible]. It is not limited to the erection [illegible]

[illegible] walls -- those of Dour Sharrukin rise to 75.5 ft. and measure 75.? ft. from one edge to the other. They [illegible] to organize an active resistance by ensuring the flanking of the ramparts by towers and by providing passages through the walls by the construction of a series of cor- [illegible]

[illegible] have a length not less than 330 ft.[1] Inside these gates [illegible] have been attributed to them by the [illegible], that is places for assembly, shelters against excess of heat by the [illegible] of their walls and vaults, and by the [illegible]; those of Dour Sharrukin afford a useful area of 10,764 sq. ft. [illegible]; 79).

[illegible]

front of 41.3 ft., a projection of 15.1 ft., and succeed each other at intervals of 89.? ft.

The house.

In conformity to the oriental custom, a dwelling in Mesopo-

Chapter 3. The Programmes and their Realization.

I. Civil and Military Programmes.

The City.

The civilization of Mesopotamia -- at least such as it appears to us in the course of the first thousand years B.C. -- comprised an already important part for civic architecture. The streets of Assour were recently cleared and were narrow and crooked, but were provided with sewers; those of Dour Sharroukin (Khorsabad) were fine streets 40 ft. wide; according to Herodotus, those of Babylon formed a systematic network by the intersection of twenty-five avenues perpendicular to the Euphrates and of twenty-five parallel to the river, s spanned by a bridge; further a sacred and richly ornamented avenue traversed the city leading to the Temple of Mardouk.

The Fortifications.

Such as are described to us by the texts relating to Babylon, and are shown by the plan engraved on the tablet held by the statue of the architect of Gudea (24 th century), and by the remains of the wall of Dour Sharroukin (end of 8 th century), fortifications in Mesopotamia manifest a remarkable skill in defense.(76; 78). It is not limited to the elements of a passive resistance; height, thickness and repetition of
12. battlemented walls -- those of Dour Sharroukin rise to 75.5 ft. and measure 78.7 ft. from one face to the other. They f further knew how to organize an active resistance by ensuring the flanking of the ramparts by towers and by retarding passage through the gates by the construction of a series of corridors and of courts, which at the entrances to Dour Sharroukin have a length not less than 220 ft.[1] Indeed these gates in time of peace took the part always attributed to them by the East, that of places for gathering, sheltered against excess of heat by the thickness of their walls and vaults, and by the current of air in their course; those of Dour Sharroukin afford a useful area of 10,764 sq. ft.(76,2; 79).

Note 1. Those of Dour Sharroukin are rectangular, have a front of 44.3 ft., a projection of 13.1 ft., and succeed each other at intervals of 88.6 ft.

122 The House.

In conformity to the oriental custom, a dwelling in Mesopo-

Mesopotamia opposed a blind wall to the exterior; a narrow c corridor gave access to a court more or less large and paved with pebbles, bricks or slabs, on which opened a principal r room for the common life and receptions, sleeping chambers and storerooms; stairs led to terraces, the nocturaal habitation during the hot season. It appears indeed -- Herodotus affirms it for Babylon -- that certain elevations comprised one or even several stories.

The Palace.

The form and general arrangement of the palace in Mesopotamia was adapted to the position of the master, the customs a and the country (77; 78).

And first, like the temples, they dominated above the community the human dwellings, being always perched on an artificial terrace, which rose to some 32.8 or 49.2 ft.[1] and might extend to 98.4 ft., like that in Babylon supporting the Palace of Naboukodonosor discovered beneath the hill of Babil. Access to these heights was arranged by ramps and by stairs built agains the supporting walls. Without speaking of the advantages found therein by the builder,[2] this mode recommended itself by the fact, that the prominence of the royad dwelling manifested the sublimity of the sovereign, at the same time that it strongly contributed to its security.

Note 1. The height is 32.8 ft. at the southern Palace of Naboukodonosor at Babylon, 39.4 ft. for that of Gudea at Tello, and 45.9 ft. for that of Sargon at Khorsabad.

Note 2. See page 133.

In the number of essential characteristics of the palace in Mesopotamia again figure the grandeur of its dimensions, the result of the necessity for ensuring in buildings without upper stories, besides the private dwelling of the master, a g governmental administration, a body guard, a numerous household, and also storage for a mass of articles, various provisions and the produce of imposts and tributes paid in kind. Already the terrace bearing the Palace of Tello measured 656 ft. on a side and the structures covered 17,686 sq. ft.; nearly 27.4 acres were occupied by the two hundred and nine new halls and the thirty courts of the residence of Sargon at Khorsabad.

123 The arrangement realized in very satisfactory fashion dist-
inction and isolation -- required in all times by the customs
of the East -- of the private residence (harem), the apartme-
nts for reception (serail) with their grand hall (selamlik),
and the common rooms (khan). It succeeded in this by assign-
ing to each of these divisions a separate and distinct quart-
124 er, the various service rooms being arranged around a court,
that possessed its special entrance and only communicated wi-
th the adjacent parts by narrow and crooked passages, easily
barricaded; in particular the access to the private portions
of the residence was carefully prevented.

Whether it related to the whole or one of the elements --
the hall, court etc., the outline was always that of a paral-
elogram, square or rectangular; likewise the orientation of
the edifice by its angles was constant, and by this no facade
was entirely north.

The proportions of the courts varied according to the impor-
tance of the services, whose rooms opened on them; at Tello
the largest occupied 3843 sq. ft., and at Khorsabad the prin-
cipal one covered not less than 2.47 acres. On the contrary,
the halls were relatively small, and for structural reasons,
(page 136), they were only extended in length; at Tello the
125 greatest width is but 12.0 ft. for a length of 39.4 ft.; at
Nimroud this increases to 23.0 ft. and attains 32.8 ft. at
Khorsabad.

With their towers, vaulted passages, courts and internal
chambers, the gates of the palaces in Mesopotamia form actual
castles, which served not only for fortifications, but also
for external waiting halls.(76,2).

As the residence of a sovereign, who was priest as well as
126 soldier, a palace in Mesopotamia was always furnished with an
oratory composed of a tower in stories and a chapel.(P. 127).

Texts, of which the most ancient is signed by Tiglathphala-
zar II (743-727), teach us that an Assyrian palace counted a
among the number of its essential elements an edifice "after
the fashion of the country of the Hittites, which their lang-
uage termed a hilani",[2] named hekal in Assyria. This -- we s
shall return to it in speaking of architecture among the Hit-
tites (P. 152) -- was a state residence comprising a spacious

vestibule on columns, a throne hall and a chamber for repose. (77, 2, 4; 78).

Note 2. Inscription of Sargon. See similar ones of Tiglathphalazar, Sennecherib and Assourbanipal.

The summer residences of the kings and of the great men possed the pleasure of gardens, laboriously maintained by means of irrigation, enlivened and refreshed by canals and basins; those were celbrated, which were ordered by Sennacherib at K Koijunkjik and by Naboukodonosor at Babylon. Their views were enjoyed from the shelter of kiosks, chiefly open and which we know by their representations on the reliefs of Koijoundjik and of Khorsabad.

Palace or house, the habitation in Mesopotamia was provided with certain comforts.

The protection against heat consisted of the extreme thickness of the walls and of the covering; in the arrangement around the courts of the harem of a sort of deep niches with e elevated floors, which hangings and portieres sheltered from light and rain, and that formed small fresh and ventilated rooms; finally by a wise restriction of the openings. Lighting and ventilation were substantially ensured by the doorways, which indeed were of great dimensions,[1] and additionally by pottery tubes passing obliquely through the covering.

Note 1. At Khorsabad, the width of the doorways varies between 6.6 and 9.8 ft.

As suitable in a country exposed to deluging rain and torrid heat, great precautions were taken for the removal of water and sewage.

All the houses uncovered at Assour were furnished with a s sewer; the Palace of Khorsabad possessed a complete system of drainage discharging into great collecting sewers.[2] (80). Finally a bath hall was an essential part of every arrangement.

Note 2. At the centres of most halls, a hole about 4.7 ins. in diameter is pierced in a square slab and forms the opening to a descending duct 11 ins. in diameter; at first vertical and then inclined, ending in a sewer 3.3 ft. wide and 4.6 ft. high.

II. Religious Programmes.

A temple in Mesopotamia comprised two very distinct parts;

a symbolical monument and a divine dwelling.

Chaldean chronology conceived the earth as a mountain, vertically divisible into seven zones, the upper one being the dwelling of the gods, and horizontally into four cantons arranged according to the cardinal points. This belied was embodied in a Ziggourat (ziggomatou), a tower in several stories, to which was applied the significant names of "house of the terrestrial mountain", "mountain erected toward the sky like the great mountain".

The plan of a ziggourat always formed a parallelogram orientated by its angles; but its elevation comprised two types, one peculiar to southern Chaldea, and the other to Babylonia and Assyria. The first, an idea of which is permitted by the ruins of Ourou, Eridou and Ourak, superposed three cubical m masses, unequal in area and height, the two upper ones receding toward the rear of the monument, the last one being crowned by a chapel, and all being accessible by stairways.[1].(81, 1). The second form was detailed by Herodotus according to the example offered to him by the Ziggourat of Esagila, the great Temple of Mardouk at Babylon, denominated Etmauki. "It is", he writes, "a regular square measuring two stadia on each side (1214 ft.). At the centre is seen a massive tower, a stadium in length and width (607 ft.); on this tower rises a another, and on this second is yet another, and so forth, so that one counts as many as eight, including the terrace. The ascent is made externally by means of a ramp winding around all the stories. In the upper tower is a great sanctuary, in this large sanctuary being a richly furnished bed, near which is a golden table; no statue is to be seen there". Strabo adds that the height of the monument equalled the length of its b base (607 ft.). The excavations at Khorsabad have confirmed the statements of the Greek traveler by uncovering a ziggourat placed on a square of 141.4 ft. side, each story of which is 20 ft. high, and is accessible by a ramp with steps 6.6 ft. long.[1] (81, 2; 78).

Note 3. At Ourou the lower story was about 19.7 ft., the upper being 26.3 ft. and the intermediate one 32.8 ft.

Note 1. At Nippur, the excavations revealed a tower still 98.4 ft. high.

As for the house of the god, the plan is known by a description of Herodotus and by the results of exeavations of Nippur, Babylon and Assour; it was generally simple but otherwise con-
129 ceived in the image of a human habitation. It comprised a p primary court, surrounded by the dwellings of the priests and storerooms; an interior court on which opened the treasuries and the chapels; finally the sanctuary which formed a hall f furnished with a bed, a table and a niche, the place of the statue of the deity. The palace of a supreme god -- such was that of Mardouk at Babylon,-- comprised in addition to the p parts just named, on the one hand a "chamber of destiny" (parakschimale), where on the first of each year the deity determined the future; on the other being a "house of sacrifice", (bitnike) or of the "feast of the new year", and a certain number of chapels, which we might call the chambers of friends, in which the master entertained and lodged the vassal deities, who came to render homage to him at the beginning of the year; further, one or several altars in the open air; finally a sacred way of access between richly decorated walls.

The rare examples of commemmorative or votive monuments known belong to the category of steles and embody two different types; on the one hand -- we owe an example to Salmanazar II -- a sort of stepped obelisk, or rather a pile of truncated pyramids with decreasing areas and heights; on the other being a fluted slab, that terminates in a palm leaf, a specimen of which was found at Khorsabad (82). A slab set on a p plinth, that is placed on a substructure, sometimes cut in steps, forms the elements of an altar; the plan sometimes is a triangle and sometimes a rectangle.

130 Chapter 4. The Construction.

In the entire extent of its area and in all the periods of its history, construction in Mesopotamia appears conscientious and skilful, as attentive to the correctness of the work as to the quality of the materials.

I. The Materials.

These are reduced almost entirely to clay, not only in Chaldea, where there is no choice of materials, but also in Assyria, where however stone in abundance was at command and artisans skilled in cutting it, as we shall verify later. This preference is explained by the facilities offered by construction in earth to architects frequently charged with colossal works and compelled to rapid execution; further being forced to employ unskilled workmen in very large measure.

Clay was only used after being well worked and mixed with chopped straw. It was employed either in this state for the massing of walls or forming vaults, or was made into burned or crude bricks, which was customary for all careful construction. These were of several sorts, varying in form and manufacture. As in the case of the most ancient,[1] some are characterized by simple shaping into rectangular form with modest dimensions (length of some being 7.9 ins.), half as wide and one fourth as thick), finally with unsymmetrical faces, one being plane and the other convex, with cavities and grooves made by pressure with the fingers.(84, 1). More frequently they are cakes moulded into square forms.

Note 1. For example, those furnished by the deep layers of the ruins of Nippur or the structures of Our Nina at Tello.

Most of these tiles were employed in the crude form, either after drying -- which was the Chaldean custom -- or still wet, which was the manner in Assyria. Primarily about 7.9 ins. 1 long, later from 11.8 to 19.7 ins.;and 2.2 to 4.3 ins. thick, they are characterized by an extreme compactness.

Burned bricks were very greatly used in the architecture of Mesopotamia in all times, and particularly in Chaldea, in spite of the scarcity of fuel, were of rare quality. "The texture of those found at the Palace of Sargon at Khorsabad is h homogeneous with an unequaled fineness of grain; made like s stone by burning, they ring under the hammer like a bell; th-

resist tests, that no stones of the same dimensions could support with impunity. "in fact, these are Assyrian tiles, which for a surface of nearly 2.6 sq. ft. measure no more than 2.0 ins. thick!" [2]

Note 1. See Place, Vol. 1, page 226.

Note 2. In Chaldea the current form was a tile measuring 11.8 to 12.6 ins. on a side for a thickness of about 3.3 ins.

Let us add, that brickmakers in Mesopotamia understood how to make their products in various forms appropriate for the required purpose; that of a triangular prism for angle bricks, of a disk, sector or segment of a circle for the elements of a built column.(84, 3); that of a trapezoid for voussoirs of vaults etc.(86, 3; see page 135).

Even in Assyria, the architecture of Mesopotamia never employed stone except under the empire for necessity or for ornamentation. In Chaldea were fashioned in diorite the sockets for the pivots of doors, and of the same material were made the thresholds. In Assyria limestone was used for substructures; alabaster and sometimes basalt for facings, but economy caused it to be limited for the first to spalls between two facings of slabs set on edge, and for the second to thin facings.

Yet the Mesopotamians knew at all times how to cut stone; even the Assyrians made proof of remarkable skill, cutting in limestone blocks measuring 176.5 to 353.0 cu. ft. and very carefully dressed;[1] quarrying alabaster also in blocks weighing 4.4 tons and in slabs with areas of 80.7 sq. ft. (length 9.8 ft. and height 8.2 ft.) measuring no more than 7.9 ins. thick!

Note 1. Those forming the retaining wall of the terrace of the Palace at Khorsabad measure in some cases 9.8 ft. long, 3.3 ft. wide and 6.6 ft. high; others are respectively 8.9, 6.6 and 6.6 ft., weighing 1.43 to 2.65 tons.

As for wood, the Chaldean builder found himself reduced to the miserable material of the palm tree; the Assyrian could in a more restricted degree utilize the oaks of the adjacent mountains. But both, when laboring for a sovereign, had at command the most valuable kinds; cedar and cypress were impo-

[illegible] qualities; though with great diffi-
culty.

II. Technique.

The Walls.

In general the rapidity of construction in crude bricks in countries were exposed to torrential and atmospheric humidity to settlements, [illegible], even to destruction of its surface. [illegible] [illegible] -ities. All simple and some ingenious, several with more successful results.

Let us first note a method of building, that the walls nor- [illegible] [illegible] of the [illegible], have firm and stable surface.

No less habitual was the protection of the masonry of crude bricks, either by means of a coating of earth, plastered [illegible] mixture of earth and [illegible] remarkable for its density and adhesion, or by a facing laid in courses of glazed bricks, [illegible] [illegible] of enamelled tiles or of a stone facing; [illegible] -- to build the base of a wall on the [illegible] by placing it on a stone [illegible] of systematic drainage, which we have already had occasion to mention.

Yet the architecture of Mesopotamia gave too much care to [illegible] served in the greatest measure the solidity of a structure. Indeed, whether of bricks or stones, [illegible] or cement, it is always [illegible] regular and constant; the beds are always leveled and joints are broken (Pl. 2, 3).

The methods of construction in crude bricks were not the [illegible]

[illegible] of the [illegible] was obtained by [illegible]

imported in considerable quantities, though with great difficulty.

II. Procedures.

The Wall.

To remedy the fragility of construction in crude bricks in countries were exposed by terrestrial and atmospheric humidity to settlements, slips, even to destruction of its surface, and by heat and wind to injury by drying to powder and being blown away, the architecture of Mesopotamia invented various artifices, all simple and some ingenious, several with more important results.

Let us first note a method of building, that the walls normally have thicknesses of 9.8 to 16.4 ft., that those of 26.3 to 39.4 ft. were frequent, and that the cross section of a c city wall might even measure 82.0 ft.! Enormous likewise, the terraces supporting the palaces and temples, at the same time isolated them from the dampness of the ground, having a firm and stable surface.

No less habitual was the protection of the masonry of crude bricks, either by means of a coating of earth, plaster, or a mortar of earth and plaster remarkable for its density and i adhesion, or by a facing made in Chaldea of glazed bricks, or in Assyria composed of enameled tiles or of a stone facing; at need, the builder at Nineveh confined himself -- like the constructor of the enclosure at Khorsabad -- to equip the base of a wall on the same principle by placing it on a stone plinth. To these precautions were added for the mass of the terrace that of systematic drainage, which we have already h had occasion to mention.

Yet the architecture of Mesopotamia gave too much care to the masonry, for us to presume otherwise, than that on it depended in the greatest measure the solidity of a structure. Indeed, whether of bricks or stones, ancient or recent, it a always appears regular and coherent; the beds are always leveled and joints are broken.(84, 2, 5).

The methods of construction in crude bricks were not the same in Assyria and in Chaldea. In the first of these countries the adherence of the courses was obtained by employing

the bricks in a soft state, so that when a wall was finished, it was not a pile but a solid mass. In the second, only dried bricks were used, which were joined by the aid of an adhesive material; this was sometimes clay -- there are examples of such at Tello and at Babylon; sometimes -- the case is common at Babylon and at Nineveh -- a lime mortar; sometimes -- as at the ruins of Mougheir -- a mixture of ashes and lime; the use of which has continued in the same places until our days; sometimes -- as observed at Babylon -- with bitumen.

As for burned bricks, they were either joined with mortar or with bitumen. Note that primitive Chaldea -- as proved by the walls of wells or of canals at Nippur and at Tello -- sometimes set them in "herringbone bond".(84, 1).

In Assyria the erection of a stone wall comprised neither jointing with mortar nor connection by cramps. Where it was composed of a filling of stones between facings, the stability of the two kinds of elements was ensured by seeing that a alternate blocks were extended into the nucleus.(84, 5).

From the most ancient times, construction in Mesopotamia knew and commonly applied the methods of strengthening a wall, comprising the insertion of ties and flanking the wall by buttresses. In Chaldea a brick wall comprised at larger or smaller intervals a bed of reeds baubed in bitumen; sometimes timber anchors were embedded in the mass. As for buttresses, which appeared at the ruins of Warka or of Tello as well as in those of Khorsabad, the importance of the part assigned to them is manifested by their number and by the care with which they were arranged; in Chaldea they were joined with bitumen; those of Khorsabad were massive counterforts, 13.1 to 29.5 ft. wide and projecting 4.9 to 8.2 ft.(81, 1).

With these different precautions are contrasted negligences, verified at Khorsabad, of building the walls on the pavement of the terrace without any substructure; a relative negligence, assuming the almost absolute incompressibility of the mass of clay beneath them.

The Isolated Support.

It does not appear, that the architecture of Mesopotamia made great use of the isolated support. Indeed in its Chald-

[illegible] this was [illegible] by [illegible] in [illegible]

[illegible]. [illegible] there [illegible] a small number of [illegible] principally from lower Galilee, [illegible] and [illegible], [illegible]

[illegible]

[illegible] already taken into account; 77, 8); the excavation [illegible] and of [illegible] have [illegible], [illegible] does not [illegible] (..). [illegible]

[illegible]

[illegible] in [illegible] the trunk of a [illegible] tree [illegible] of which, by revealing a shaft composed of one [illegible]

[illegible]

[illegible] about [illegible] in. thick and [illegible] on [illegible], [illegible] of the [illegible]. [illegible]

[illegible]

[illegible]).

[illegible] and its [illegible].

The floors of the interiors were greatly [illegible], which is explained by the [illegible] love of the [illegible] and [illegible]; they were sometimes covered with [illegible], and [illegible] covered with [illegible] clay [illegible]; for most of the time they were [illegible] of [illegible]. [illegible] century, [illegible] were the [illegible] of [illegible] by the necessity of [illegible] the [illegible] from all [illegible] of water. They received a [illegible]

[illegible]

[illegible] of stones of large dimensions, [illegible] as [illegible] in. and [illegible] up to 3.3 in. thick. [illegible] two layers of tiles, separated by a layer of [illegible], the lower one being set in a bed of bitumen.

The [illegible] of [illegible] by ceilings and by vaults.

The first -- mentioned by [illegible] and still [illegible] in [illegible]

[illegible]

Chaldean domain this was prevented by the lack of stone and of wood. Yet there are a small number of specimens of columns originally from lower Chaldea, Babylon and Nineveh, without mentioning those figuring in the representations of Assyrian kiosks already taken into account; (77, 5); the excavations of Nimroud and of Khorsabad have exhumed actual examples, but their purpose does not appear certain. (89). Discoveries recently made at Babylon have confirmed the statements of Strabo in regard to posts made of the trunk of a palm tree hooped by bands of willow, by revealing a shaft composed of one of these trees enclosed in a covering of bricks set in bitumen. Finally, the remains of the Palace of Gudea at Tello show piers about 5.9 ft. thick and built on rectangular bases, forming a group of four cylindrical columns. Each one of these superposes courses of burned bricks in the form of disks, setors and segments of a circle, very skilfully set with bitumen in a manner to ensure a constant alternation of joints. (84, 3; 85).

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The Ground and its Covering.

The floors of the interiors were greatly neglected, which is explained by the inveterate love of the East for rugs and mats; they were sometimes paved with alabaster, and as frequently covered with burned clay tiles; but most of the time, they were nothing more than an area of tamped earth. On the contrary, surfaces beneath the open sky were the object of c care required by the necessity of protecting the mass of the terrace from all penetration of water. They received a pavement perfectly jointed, generally of large burned bricks, sometimes of stones of large dimensions, covering as much as 10.8 sq. ft. and measuring up to 2.6 ft. thick. At Khorsabad are superposed two layers of tiles, separated by a layer of sand, the lower one being set in a bed of bitumen.

The architecture of Mesopotamia practised at the same time covering by ceilings and by vaults.

The first -- mentioned by Strabo and still employed in our days in the same regions -- consisted in a floor made of the joined trunks of palm trees, or when it belonged to a palace or a temple, of beams of cedar or of cypress. (86, 1; 87, 3).

[illegible], which on the exterior of Egypt was com- mon [illegible] because of the lack of wood, it was combined, [illegible]

[illegible] were [illegible] (Fig. [illegible]).

[illegible] — as [illegible] — as proved by the [illegible] of the [illegible] (70, 81). [illegible] about [illegible] ft. [illegible] and [illegible] ft. wide.

[illegible]

[illegible] in the same [illegible] to [illegible] with the difficulties of [illegible] [illegible] them [illegible] by [illegible] of [illegible] [illegible] (68, 69), and by [illegible] of [illegible] [illegible] (66, 67).

[illegible], [illegible] the [illegible] of [illegible], with [illegible] 21.8 ft. [illegible] ft., with a [illegible] of 7.8 ft.:

very [illegible]; in [illegible], [illegible]

[illegible]

with tempered clay; the method was that of countries poor in wood, being in [illegible] courses; in case of a wide span, the [illegible] was strengthened by buttressing three sides.

The roof was terraced; a layer of trodden clay with a thick- ness of more than [illegible] ft. [illegible] the interior [illegible] as from heat ([illegible]). Formerly, as today in the same

As for the second, which on the evidence of Strabo was common at Babylon "because of the lack of wood", it was composed, either of hemispherical or elliptical vaults pierced by an o opening at the top -- whose image has been preserved by the Assyrian reliefs (86, 2) -- or by tunnel vaults, in executing which the constructors in Mesopotamia were passed masters.

The exploration of Chaldea has revealed, that from the second half of the third thousand years before the Christian era, there was known and commonly applied there not only the method of corbelling -- as proved by the tombs of Mougeir (Ourou) (86, 4), but also that of the radiating beds, -- as proved by the galleries of the Temple of Nippur of of the Palace of Goudea at Tello (86, 5). The latter are tunnel vaults of irregular elliptical section, about 3.3 ft. high and 20 ft. wide. The ruins of Khorsabad proclaim the consummate skill of the Assyrians in the construction of vaults; they built them indifferently with semicircular, segmental or elliptical curves; passing in the same gallery from one form of arch to another and sporting with the difficulties of connecting them; they joined them equally by the method of arches turned without c centres (86, 3), and by that of radiating courses built on s supporting centres.)86, 6; 79).

Finally, they understood how to covyr wide spans; the tunnel vaults of the gates of Khorsabad, with crowns 21.2 ft. above the ground, had spans of 14.1 ft. with a rise of 7.9 ft.; they continued the jambs and their semicircular curves were very regular; in the ruins of the Palace, Place discovered "even the coverings of their stucco - - - considerable pieces of vaults fallen in mass - - sometimes measuring several yards in length, 3.3 or 6.6 ft. span and more than 3.3 ft. thick at the crown".

The materials were dried bricks of appropriate form joined with tempered clay; the method was that of countries poor in wood, being in inclined courses; in case of a wide span, the arch was strengthened by superposing three rings.

The roof was terraced; a layer of trodden clay with a thickness of more than 3.3 ft. protected the interiors as well from rain as from heat.(87, 3). Formerly, as today in the same

regions, by choice above it was placed a platform supported by small pillars and columns, which was likewise covered with earth; this provided an agreeable lodging and a circulation of air, that prevented the heating of the covering.(86,1;79).

To the ordinary massiveness of their buildings, the Mesopotamians contrasted the lightness of the little structures for use as kiosks, whose image is preserved to us by the sculptured monuments.(77, 5). In stone, they were made of a ceiling set on entablatures widely corbelled and supported by columns placed on a substructure; in wood, they consisted of a framework on slender little columns, which served as a frame for a canopy of leather or cloth.

In brief, the architecture of Mesopotamia had the merit of producing a very satisfying result from an ungrateful material, and to it belongs the honor of having introduced for the benefit of humanity the most monumental of all modes of covering, the only one adapted to large spans, that of the vault.

139. ## Chapter 5. The Effect.

All kinds of effects at the command of the art of building were known and utilized by the architecture of Mesopotamia. But like all its oriental sisters, it preferred those of the order of the senses and gave a wide field to the decoration. It is true that its abilities in large measure were limited by the nature of its materials.

I. Effects of Picturesque or Affecting Order.

That it may have had a feeling for the grandiose is attested by many general or special characteristics in arrangement. In the entirety, its edifices possessed in a very high degree a character of force and majesty; they owed it to their enormous proportions, to the height of their terrace, the lengths of their facades, the amplitude of their ramps and of their stairways; to the simplicity of their form by straight lines and rectangles, and to their arrangement by repetition of a small number of elements; to the monotony of their appearance, and to the horizontal lines in their elevations.

There was added in greater or lesser measure an expression of a mystical order, to which must have been sensible, races interested in astronomy and astrology; it results from the systematic orientation of the plan by the angles; from numerical combinations like that which equalized the height of a ziggarat and the side of its base; from the quite frequent s subordination of the arrangement to exhibit the number seven.[1] Thus were numbered by seven the stories of every ziggarat, t the rounds, pilasters, engaged columns, and the decoration of many mural surfaces.[2]

Note 1. Consecrated by the fact, that it is that of the " "lights of the earth", the sun, moon and five planets; that of the days of the week, etc.

Note 2. Compare at Warka seven panels with seven recesses in each; at Khorsabad on the wall of the harem are seven rounds.(87, 1; 88).

140. ### II. Effects of Harmonic Order.

The Mesopotamians were too well versed in mathematical speculations, for their architecture to not accord with the effects caused by this understanding. The ruins of their monuments presents the verification of their existence. Yet witho-

[illegible] of the [illegible] that must necessarily [illegible] [illegible], [illegible] all [illegible] being of the same size, a [illegible]; it is remarkable, for example, that all the sections of the [illegible] of a wall may be [illegible] [illegible] is in [illegible] the [illegible] form of the battlements; and [illegible] that the [illegible] of the towers of the wall enclosure [illegible] are precisely [illegible] those of the outside walls [illegible] by [illegible] (Fig. [illegible] to [illegible]).

Note however, that if the regularity of a geometrical [illegible] characterizes the arrangement of the plan of a [illegible] [illegible], symmetry is absent from it. The distribution of a building does not [illegible] the elements, and it [illegible] the [illegible] of an [illegible] axis; likewise a series of [illegible] [illegible] of [illegible] does not necessarily mean equality of intervals.

III. [illegible] of the [illegible] of Relief.

[illegible] of [illegible] an elevation with regard to the interior and of [illegible] to [illegible] the external [illegible], and thus [illegible] [illegible], the architecture of [illegible] [illegible] in the [illegible] of [illegible] relief, more than its [illegible] [illegible].

[illegible]

[illegible] to [illegible] the eye; generally this was a [illegible] [illegible], [illegible] by the [illegible] of a [illegible] [illegible] or [illegible] by [illegible], and [illegible] [illegible] from the wall by the [illegible] of [illegible], [illegible] its projection; [illegible], as [illegible] to the architectural [illegible] [illegible]

[illegible] an [illegible], [illegible] by several

[illegible] -- there was a cornice with [illegible], [illegible] in the [illegible] fashion, nonetheless [illegible] from the [illegible] of the [illegible] (Fig. [illegible]).

[illegible] and [illegible] equally favored in all periods of

without speaking of the rhythm that must necessarily result from the fact, that all the bricks being of the same size, a all dimensions were commensurable; it is remarkable, for example, that all the merlons of the cornice of a wall may be inscribed within the same isosceles triangle, which being reversed is in its turn the exact form of the battlements; and also that the fronts of the towers of the wall enclosing Khorsabad are precisely one half those of the curtain walls flanked by them.(44.3 to 88.6 ft.).

Note however, that if the regularity of a geometrical figure characterizes the arrangement of the plan of a Mesopotamian edifice, symmetry is absent from it. The distribution of a building does not balance the elements, and it neglects the uniting virtue of an organic axis; likewise a series of engaged pilasters or columns does not necessarily mean equality of intervals.

III. Effects of the Order of Relief.

Although it must have been influenced by the oriental custom of arranging an elevation with regard to the interior and of reducing to a minimum the external openings, and that an exclusive practice of construction in earth limited its powers, the architecture of Mesopotamia showed itself interested in the effects of monumental relief, more than its Egyptian rival.

And first it recognized the necessity of accenting the skyline of its edifices, lost in the vastness of immense plains and a dazzling sky. It provided this by giving them a crowning suited to impress the eyes; generally this was a crenelated parapet, clearly outlined by the breaks of a sawtooth resting on or supported by corbels, and frankly detached from the wall by the band of shadow underlining its projection; (87, 2); sometimes, as indicated by the architectural representations given by the reliefs of Koijunkjik, the series of merlons surmounts an enormous cornice, accented by several projections; or again -- shown by the supporting walls of the throne hall at Khorsabad -- there was a cornice with towers, cavetto and band in the Egyptian fashion, doubtless imported from the banks of the Nile.(87, 4).

Assyrians and Chaldeans equally favored in all periods of

their history the movement -- in truth very moderate -- imparted to a wall, either by the hollows of vertical grooves or by the relief of the pilasters of rectangular section or of half columns, these moreover being only the decorative transposition of a structural form, that of the palm trunks, which in all times in that country served as the framework for cabins of tamped clay.(87, 3). They were often satisfaied with the realization of one or the other of these two kinds of projections at a scale more or less large; at the ziggarat of Mougeir (Ourou) a facade of 197 ft. is enhanced by nine projections of oblong plan and about 1.6 ft. thick; at the ruins of Warka (Ourouk), there are seven groups of seven half columns, whose diameter measures 1.6 ft. Sometimes the two forms are combined and more or less diversified compositions are sketched out; thus the northeast front of the Palace at Tello is accented at its centre by a panel 18.0 ft. wide and projecting 3.3 ft., flanked by pilasters in three planes, on its two wings being great half columns 1.6 ft. wide, the arrangement is repeated on the northwest face with the difference that the central panel is relieved by seven half columns, and that the projections of the wings are pilasters.(77, 1). As proved by a wall at Warka and a doorway of the harem of Khorsabad (87, 1; 88), there was still liked the appearance of a row of seven connected half columns enclosed by two pilasters, perhaps the result of that of a palisade of palm trunks. As for the grooves, they were sometimes simple, sometimes arranged with reveals (87, 1, 2; 83); sometimes a refinement, an example of which is offered by the wall of the ziggurat of K Khorsabad, alternated them with pilasters.

Such as it is revealed to us by Assyrian palaces and notably by that of Sargon at Khorsabad, the arrangement of a great Mesopotamian portal aimed at and produced a monumental effect. Sometimes triple, like that giving access to the serail at K Khorsabad, the portal, with frequently a projecting archivolt happily accenting the round arch, was pierced in an ample projection frankly detached in front, clearly defined by two a angle towers, and finally enhanced by an ornamentation both magnificent and grand.(76; 78; 79).

[illegible]

the isolated supports [illegible] to [illegible] some rare materials, [illegible] and [illegible] in [illegible]. [illegible] a radical conception of [illegible] and a [illegible] base for those of a [illegible]. The shafts are cylindrical and plain, [illegible] at their ends by [illegible]. Sometimes of colours [illegible], sometimes [illegible] by volutes, sometimes like a bell, the capitals [illegible] well and satisfy the eye. [illegible] German [illegible] the future Ionic and Corinthian [illegible] (25, 1, 5, 6).

[illegible] the [illegible], a [illegible] type is shown (55, 5), and by the [illegible] we may a[illegible] the [illegible] of a [illegible], as decorative as original, [illegible] of the image of a [illegible] -- [illegible], bronze or iron -- on the [illegible] a [illegible] (58, [illegible], 57, 6) 1

[illegible] of his palace of [illegible], he had caused to be made in [illegible] as many columns. [illegible] the Hittite realization of the same motive (58 1 [illegible]).

IV. Effects of Ornamentation.

In the first rank of the characteristics of the architecture of [illegible] the luxury and splendour of the ornamentation [illegible] the [illegible] of its [illegible] or [illegible].

Effects of Materials.

At least this was [illegible] by a coating 2 to 4 ins. thick [illegible]

[illegible]

[illegible] was [illegible] at the palaces of [illegible] of [illegible]; the interiors were [illegible] lined with wainscoting of cedar or cypress. Besides the [illegible] were [illegible]

[illegible] of [illegible].

In Chaldea, the geological and botanical conditions [illegible] the use of sculptured ornamentation. Yet in the [illegible] [illegible] to the [illegible] of [illegible] is a

143 The infinite quantity of data relating to the sculpture of the isolated supports furnished to us by some rare materials, mostly graphical and originating in Assyria, announce a rational conception of forms and a pronounced taste for those of a geometrical kind. The shafts are cylindrical and plain, limited at their ends by toruses. Sometimes of bulbous shapes, sometimes as an oblong cap terminated by volutes, sometimes like a bell, the capitals appear well and satisfy the eye. (89). Certain kinds announce the future Ionic and Corinthian formulas.(89, 1, 5, 6).

As for the bases, a bulbous type is known (89, 3), and by the frequency of its representations now possessed, we may a appreciate the vogue of a kind, as decorative as original, c composed of the image of a quadruped -- bull, sphynx or lion -- on the back being placed a cushion.(89, 10; 87, 6) [1]

Note 1. An inscription of Sargon informs us that for the hekal of his Palace of Khorsabad, he had caused to be made in bronze four pairs of supporting lions, serving as bases for as many columns. Compare on page 157 the Hittite realization of the same motive.(98, 1, 2).

IV. Effects of Ornamentation.

In the first rank of the characteristics of the architecture of Mesopotamia appear the luxury and splendor of the ornamentation by which it relieved the gloomy appearance of its masonry of crude or burned bricks.

144 Effects of Materials.

At least this was masked by a coating 2 to 4 ins. thick in Chaldea, 0.1 to 0.2 in. in Assyria. When the means were at command, the lower zone of the walls was covered by a stone facing, whose material was marble at the Ziggarat of Susa; a alabaster at the Palaces of Nimroud, and basalt at the Hilani of Khorsabad; the interiors were frequently lined with wainscotings of cedar or cypress. Besides the thresholds were made of diorite or alabaster (91), and the jambs of the doorways were of the second of these materials.

In Chaldea, the geological and botanical conditions opposed the use of sculptured ornamentation. Yet in the inscriptions of Goudea relating to the erection of a temple, mention is m

[illegible] stones, and [illegible] to use it [illegible] and in [illegible]; in the palace of Sargon [illegible] colossal statues [illegible] (?), and these were suffic- [illegible] (?) to realise a length of 1.44 miles [illegible]

[illegible]

Above all, the [illegible] of [illegible] loved color and [illegible]. It covered the [illegible] with different [illegible] [illegible] the sculptures.

[illegible] as well as [illegible] was lavished the w[illegible] of the [illegible]; [illegible] were made [illegible], [illegible] and [illegible], as [illegible] of the [illegible] of [illegible];[1] [illegible] like those of the [illegible] of [illegible]; [illegible] like that [illegible] on the top of the [illegible] of [illegible], according to the evidence of [illegible]. With silver and gold were cov- [illegible], [illegible] of the sanctuaries, of [illegible] [illegible] and the [illegible]. [illegible]

[illegible] times. [illegible], as [illegible], [illegible] itself to [illegible] a sort of [illegible], [illegible] (90, [illegible]); sometimes, as at [illegible], [illegible] a series of [illegible] covered with a [illegible]

[illegible]

The [illegible] varied [illegible] in strong [illegible]. In [illegible] of [illegible], of which [illegible] as the [illegible] [illegible] of [illegible] to [illegible]; green [illegible] [illegible] were [illegible] white [illegible] [illegible]; [illegible] red, yellow and blue. The [illegible] of the [illegible] was [illegible] blue, [illegible] and a violet [illegible]

[illegible] blue, which served for the [illegible] and by a [illegible] [illegible], that [illegible] the [illegible]: [illegible], [illegible] green, black and white. [illegible] chromatic series.

made of monsters carved in cedar. On the contrary, Assyria was well provided with easily worked stone, and was pleased to use it in relief and in the round; in the Palace of Sargon at Khorsabad were counted no less than 48 colossal statues p performing the function of jambs (73), and there were sufficient sculptured slabs (92) to ralize a length of 1.44 miles 20 ft. high!

Effects of Color.

Above all, the architecture of Mesopotamia loved color and splendor. It covered the plastering with distemper paintings in polychrome and illuminated the sculptures.

On the exterior as well as the interior was lavished the u use of the metals; of bronze were made lintels, jambs and thresholds, as proved by that of Borsippa of the time of Naboukodonosor; [1] animals as supports of columns like those of the Hekal of Khorsabad; coverings of roofs like that shining on the top of the Ziggurat of Susa, according to the evidence of Assourbanipal, its destroyer. With silver and gold were covered the walls, domes and columns of the sanctuaries, of those halls and the royal apartments. It was also passionately fond of enamel, excelling in its manufacture from the most d distant times. Sometimes, as at Warka, it limited itself to scattering spots by inserting in the masonry a sort of pottery pegs, whose heads were enameled (90, 1, 2); sometimes, as at Babylon or Nineveh, with a series of tiles covered with e enamel it formed bands or arches, or even covered entire facades.(79; 88).

Note 1. Preserved in the British Museum.

Its palette was varied and rich in strong tints; It employed for fresco black, of which great use was made at the bases of the walls for a height of 1.6 to 3.6 ft.; green with which the backgrounds were coated; white was supplied by reserving the stucco; also dark red, yellow and blue. The polychromy of the sculptures was reduced to blue, vermilion and a violet tint. That of the enameled facings was dominated by a quite dark blue, which served for the backgrounds and by a slightly orange red, that tinted the motives; in a large measure, it comprised green, black and white. Certain chromatic scales

were demanded by reasons of a mystical order; such as that of the ziggarat, whose seven stories were colored, the lowest b being white, the second black, the third red, the fourth blue, the fifth vermilion, the sixth silver and the seventh gold; colors emblematic of the sun, moon and planets.

149 Choice and Interpretation of Motives. Execution.

The ornamental treasury of architectural decoration in Mesopotamia included geometrical figures and very conventional images of realities; In primitive Chaldea, these were triangles, lozenges, chevrons and spirals (90, 1); in Babylonia and Assyria, merlons (90, 5), very elegant arabesques, lotuses, palm leaves and rosettes, in the same taste though not imitations of analagous Egyptian motives (90, 3, 4, 6, 9 - 14), a and also representations of plants, like the two palms of cedar covered with gilded bronze and nearly 33 ft. high, which stood before the gate of the harem of the Palace of Khorsabad [1] ; images of animals, bulls and particularly lions, as they were painted on the walls of the sacred way of Babylon.(87, 6; 88).

As for the repertory of significant motives, it comprised the images of the gods, the illustrations of religious subjects, representations of religious ceremonies, royal ostentation, scenes in war, hunting and in familiar life (92); figures of fanciful animals, especially the winged bulls with human heads, which under the name of keroubs (cherubim ?) stood as mystical guards at each side of the gates, "placed there to repel the wicked", as the texts state.(73; 79)!

To the merit of remarkable execution, Mesopotamian decoration added that of appropriateness. The external sculpture w was truly monumental; the interior adapted the dimensions and the relief of the figures to the dimensions of the hall and the projection, dividing at need the surface to be decorated into spaces more or less numerous, in proportion to the necessary reduction of scale. The ornamented facings accented the great lines of the elevation, and composed simple and free h harmonies, accordant with the degree of the lighting of the place.

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Part II. Primary Styles of Western Asia.

We have already had occasion to mention the situation anf the historical role of the primary architectural styles of w Western Asia in relation to those of Egypt and of Mesopotamia; a situation of assured dependence and of relative originality; the role of transmission to the West of the inventions realized on the banks of the Nile and the Euphrates. We shall see by numerous manifestations significant of knowledge and initiative, that they have rights to our sympathetic attention.

Section 1. Hittite Architecture.

The Hittite people, -- which the Bible calls Hittim, the E Egyptian texts Khiti, and the Assyrian Khati -- had for their own domain, on the one hand the eastern region of Asia Minor watered by the Kyzil Ermak (Halys), and which was their native country; on the other southern Syria between the Euphrates and the gulf of Alexandretta. But in some periods their empire extended westward to the Egean Sea and on the south to t the borders of Palestine.

I. Monumental Topography and Chronology. -- Human and Natural Conditions. -- Dependence and Radiation.

At the stops or intessections of the natural routes of western Asia, originated in all periods by the commercial or military expansion, either of the Mesopotamian empires toward t the Black Sea or the Mediterranean, or of Egypt toward Mesopotamia in Asia, are found the known monuments of Hittite architecture. On the Anatolian plateau, toward the middle of the great curve of the Halys, at the place named Boghaz-Keui, the nucleus of all communications with the seas and the adjacent countries, may be seen the ruins of a capital, Ptenia, enclosed by strong walls, inside which are visible the substructures of a palace; on adjacent sites, called Yasili-Kaija and Enijik, appear a sanctuary and a palace; at Ghiaour Kalesi, south of Angora, remains a fortress. In Syria and at the bend formed by the Euphrates after it leaves the mountains, the strong city of Carchemis or Gargamish commanded the best ford of the river. On the road from Garchemis to the gulf of Alexandretta and south of Kasen-Ali, the positions of Sakje Geuzi and of Sendjirlic were guarded by strongly fortified cities.

[illegible]

In the present state of historical knowledge, [illegible]

[illegible]

[illegible] at the beginning of the [illegible]

[illegible] climax.

On the whole, [illegible]

[illegible] of a certain [illegible] and a [illegible]

[illegible] as we have previously noted -- [illegible]

[illegible]

The same part was played by Kadesh on the great route opened by the valley of the Orontes from north to south toward Palestine and Egypt.

In the present state of historical knowledge, we can estimate at least fifteen centuries for the duration of Hittite c civilization, from the beginning of the second thousand years B. C. to the middle of the first. Until the 12 th century, the head of the Hittite empire was in Asia Minor at Pteria, whose enclosing walls may be dated from the 14 th century and the Palace from the 12 th. The ruins of Sakje Geuzi and of Sendjirli recall a period comprised between the 13 th and 7 th centuries. In the 9 th century the Hittite power entered a decadence, and the taking of Pteria by Croesus in the middle of the 6 th century put an end to its history.

On the importance of the monumental demands of a religious character, we lack information; but we know that the secular demands were considerable, on the one hand being determined by the need of fortifications in consequence of an endemic state of foreign or civil war; on the other by the luxury of sovereigns, whose power and resources are indicated by the fact, that at the beginning of the 18 th century B. C., one of them sacked Babylon, and that in the time of Ramses II (1292-1225), another could maintain himself against the empire of the Pharaohs at its climax.

On the whole, Hittite architecture remained much behind those of Babylon, Assyria, and Egypt; from the first two of these it further demanded lessons and models. Yet in the arrangement of the planr as in the construction and in decorative invention, it made proof of a certain originality and a remarkable aptitude for realizing the programme of a fortification or a residence. Indeed, as we have previously noted -- t the arrangement of the Hittite gateway was adopted by the Assyrians, while from Tiglatphalasar to Assourbanipal, not one of their proud sovereigns but boasted of having reproduced in his palace "a hekal of the country of the Hittites, which in the language of that country was termed a hilani". On the other hand, Hittite art strongly influenced those of Phrygia and of southern Syria.

An analysis of the Hittite ruins leads to the distinguishing of two architectural formulas, one Anatolian and the other Syrian, the former applied at Pteria, the latter at Sendjirli and in a certain measure at Enijuk.

II. The Programmes and their Realization.

The Sanctuary of Yasili-Kaija, formed by the arrangement of a rocky valley, whose sides were cut and decorated by reliefs, corresponds to a ritual of worship in the open air within a sacred enclosure, in the manner of the Semites of Syria.

As revealed by the excavations of Sendjirli, the military architecture of the Hittites appears equal to that of the Mesopotamians and superior to that of the the Egyptians. To the principle of passive resistance by means of thick or multiple walls, they preferred that of an active and armed defense, due to flanking the walls by towers and to fortification of the gateways.(95, 2, 3, 4; 94). These, whether of a c city or a fortress, satisfied all requirements of their purpose, being both monumental and for passage as convenient in time of peacs as difficult in case of siege. The besiegers not only had to force two passages; they could only attack t the external barrier by exposing themselves in a sort of forecourt to the crossfire of the defenders; having passed this obstacle, they found themselves at the end of a sort of ditch, attacked on four sides at once.

In Anatolia, the Hittite palace rose at the centre of a terrace carefully isolated, and of rectangular plan like itself. At Pteria (95, 1), the platform measured 459.3 by 360.0 ft., and the edifice itself was 187.0 × 137.8 ft.; halls were arranged around a central court; at the rear were isolated the private apartments.

Among the Hittites of Syria, the royal residence was arranged according to a different principle, which became a favorite in Assyria, as before noted. In reality its arrangement was only a variant of the gateway, and the discoveries of Sendjirli permit us to follow its evolution in the sense of a distribution more and more differentiated and comfortable. (95, 5, 6, 7). By covering the forecourt and placing one or two columns between the towers was produced a vestibule of

beautiful appearance. The placing of a roof over the central court and the construction of two partitions had transformed into a suite of a great central hall and two small side halls.
153 Such appeared at Sendjirli the Hilani I,[1] contemporaneous with the 10 th or 11 th century.

Note 1. The explorers of Sendjirli have distinguished by numerals the different hilanis discovered by them.

A first advance,-- that is marked about the middle of the 8 th century by the hilanis II and III of Sendjirli,-- consists in an enlargement and improvement of the lodging obtained by the arrangement of one of the towers, by a doubling of the primitive apartment, permitting the use of one part for reception -- a great oblong hall (hekal) with a salon at one extremity (debir) -- and of one section for the domestic life, w with a division into large and small chambers. At the small hilani of the upper Palace of Sendjirli, that may be dated from the last quarter of the 8 th century, the transformation is completed by a wise arrangement facilitating the communication with the different rooms.

The hilanis opened on a court, which on occasion was bordered by a portico. The programme of these Hittite structures assigned a part to the useful, as proved by the arrangement of both halls, of canals and sewers.(95, 8).

III. The Construction.

Their territory supplied the Hittites with stone and wood. The latter was then as abundant in Asia Minor as it tends to become rare in our day; and the mountains in Syria offered at pleasure various and valuable woods.

The Hittite construction in Asia Minor was not identical w with that in Syria.

The former preferred stone, of which were built the entire height of the walls of fortifications and the substructures of others. For the morder were employed great polygonal masses, scarcely roughed (96, 2); for the latter, blocks of pretty large dimensions (usually 4.9 ft. long, 4.3 ft. wide and 3.3 ft. high), carefully dressed on their faces, rough at the back and roughly dressed on the other surfaces. The great w walls, whose thickness attained even 19.7 ft., consisted of

loose stones between two facings of cut stone.[1] The masonry
155 contained neither mortar nor cramps; the solidity of two bl-
ocks was sometimes increased by forming their adjacent surf-
aces with projections and recesses fitting into each other.
The crowning of the great gateway of the walls of Pteria was
constructed by the expedient of corbelled courses; a postern
attests the knowledge of the radial arch.(96, 7).

Note 1. At Enijuk, they are of granite, and their lengths are often nearly 6.6 ft., the height of all being almost the same.

Hittite construction in Syria presents interesting peculiarities, some of which exhibit a real knowledge.

It utilized stone in the form of boulders roughly dressed
or of blocks measuring about 35 c. ft., and an economical cut-
ting was limited to their visible surfaces and joints. It al-
so employed clay shaped into crude or burned bricks; the for-
mer contained a little fine gravel and plant refuse, measuri-
ng an average of 13.8 ins. side and 5.1 ins. thick, the latt-
156 er were respectively 11.8 and 7.1 ins. Finally, it made a
great use of wood.

Stone masonry very decidedly tended to level the beds, which it imperfectly realized by filling with mud mortar and stone chips; those of bricks comprised a jointing with clay and were quite irregular.

The wall, whose thickness even attained 16.4 ft., was composed of three parts. A solid foundation of stones entirely buried or scarcely emerging was made of two inclined facings of large boulders with small materials in the middle; crude bricks composed the wall, protected by a coating of clay, pure or mixed with lime; between the two was inserted a platform of wood to level the bed of the brick portion and to make it independent of the underlying mass of stone; this sometimes consisted of a row of thansverse timbers and sometimes of a grillage of timbers alternately lengthwise and crosswise, the spaces being carefully filled with small stones or bricks set in clay mortar.(96, 1, 5, 6).

The Hittite architect willingly furnished the base of his walls with a facing of stone in blocks 2.6 to 3.3 ft. high;

an arrangement copied by the Assyrians, and whose derivative is seen in the "trellised walls" of Persia, while its principle is continued by the Greek side courses (orthostats) of the marble wall.(97; see Fig. 7. 3, 4 and case 282). In this case [illegible]

row of stones placed on the upper surfaces of these stones and fixed together by means of tenons, were then solid with a [illegible], while the [illegible] in the internal mass of the wall attached them firmly to the structure.(96, 4).

[illegible]

[illegible] end of a wooden shaft.

The covering was flat, formed of a wooden ceiling covered by a thick layer of [illegible] earth.

The floor was paved with burned bricks or stone slabs joined with lime mortar.

The [illegible] construction of masonry were skilfully joined (95, 5), and the [illegible] were channels of rectangular section [illegible] and covered by [illegible].

IV. The Street.

The [illegible] the street must have been foreign to hittite architecture. Its decorative devices -- projection [illegible] by [illegible]: contrasts of solids and voids -- vestibules, porticos and galleries; refinements in building; coatings of clay mortar with or without lime; wainscoting with [illegible] wood and applications of metals; finally, enrichment by sculpture. The doorways were particularly cared for. At Pt- [illegible]

The ornament [illegible] were [illegible], in the style of [illegible] and [illegible]: lions, bulls and griffins, sphinxes of [illegible], [illegible]; finally various ornaments, such as the rosette, [illegible]. Here, [illegible] [illegible] immediately after the Assyrian invasion of the [illegible]

[illegible] (98, 7) [illegible] that the [illegible]

an arrangement adopted by the Assyrians, and whose equivalent is seen at the "cyclopean walls"of Malta, while its principle is recalled by the base slab course (orthostatis) of the Hellenic wall.(97; see Fig. 7, 3, 4 and page 292). In this case again the necessary connection was required from wood; a course of timbers placed on the upper surfaces of these stones and fixed thereto by means of tenons, made them solid with e each other, while the cross pieces in the internal mass of t the wall anchored them firmly to the structure.(96, 4).

As for the isolated supports, they consisted of a stone base and of a wooden shaft.

The covering was flat, formed of a wooden ceiling covered by a thick layer of tramped earth.

The floor was paved with burned bricks or stone slabs joined with lime mortar.

The ducts for water were constructed of pottery tubes skilfully joined (95, 8), and the sewers were channels of rectangular section in stone and covered by slabs.

IV. The Effect.

The sentiment for effect must have been foreign to Hittite architecture. It demanded movement in masses -- projection of towers and buttresses; different levels of the ground were compensated by steps; contrasts of solids and voids -- vestibules, porticos and galleries; refinements in cutting; coatings of clay mortar with or without lime; wainscoting with costly wood and applications of metals; finally, enrichment by sculpture. The doorways were particularly cared for. At Pteria, Sakje Geuzi, Sendjirli and Enijik, figures ornament the piers, there lions, here sphynxes standing after the fashion of Assyrian and Persian keroubs (97), and sculptures animate the substructure of the walls of the forecourt.(97; 98, 3, 4).

The preferred motives were animals walking, in the style of Babylon and Nineveh; lions, bulls and griffins, scenes of hunting, war and worship; finally various ornaments, such as t the rosette, fringe and winged disk. Rude, imperfect and often coarse, the style betrays strong influences from Mesopotamia, particularly after the Assyrian invasion of the 8 th c century.

A relief of Yasili-Kaija (98, 7) informs us that the Hittite

architecture of Anatolia constructed an isolated support by meams of a fluted conical shaft and a capital with volutes of Mesopotamian origin, and which we shall have to consider, when we establish the genealogy of the Ionic order.

As for that of Syria, the excavations of Sendjirli have revealed a fragment of a very carefully wrought shaft (98, 6) and of two types of base. One, which from afar exhibits the Grecian Ionic formula, is divided into five disks, that of t the centre being very thick and projecting, the others thin, the middle ones profiled as toruses and the two extremes as fillets (98, 5). The other (98, 1, 2), as decorative as original, received the shaft on a cushion resting on the back of one or two four-footed monsters, a motive already found in t the architectural productions of Mesopotamia, and which we s shall again find in the sequel in the work of the mediaeval Mohammedan and Christian architecture, as well as in that of the Renaissance.

[illegible]

In spite of the subdivision of its population into hostile clans and the tendency of wars, Syria attained a high degree of prosperity and of civilization, at least from the beginning [illegible] [illegible] political expansion of [illegible] on the east and north-[illegible], [illegible] of the [illegible] world on the [illegible] end of the [illegible] on the north, it necessarily was strongly influenced at first, and particularly [illegible] [illegible]. From our point of view [illegible] [illegible] [illegible] and the [illegible].

Syrian builders were favored by nature [illegible] [illegible] resources in the matter of the southern and forest regions; these were the cedar, cypress and olive. Stone materials abounded in [illegible] and soft limestones and in [illegible] lavas.

[illegible]

[illegible][1] [illegible] than about the [illegible] century B. C., the people settled in [illegible] indicates the continuity of their architectural activity in the course of the third and second thousand years, and its [illegible] centuries, have been rev-ealed by the very recent exploration of the site of [illegible] [illegible] of the cities of [illegible], [illegible], [illegible], [illegible] and [illegible], located from south to north at the west of the [illegible] end of the desert.

Note 1. The representation of the siege of a Syrian city [illegible]

I. Structures and their Techniques.

Architecture in Syria was not [illegible] to monumental pro-portions. [illegible] [illegible] [illegible] small scale. On the contrary, on account of the [illegible] excessive scarcity of [illegible] and the extreme insecurity of [illegible] [illegible] [illegible]

159 Section II. Syrian Architecture.

In spite of the subdivision of its population into hostile class and the frequency of wars, Syria attained a high degree of prosperity and of civilization, at least from the beginning of the third thousand years B. C. Pressed by the economic and political expansion of Mesopotamia on the east and northeast, that of Egypt on the south, of the Egean world on the west and of the Hittite empire on the north, it necessarily was thereby influenced at first, and particularly by the former. From our point of view may be distinguished two provinces, the Canaanite and the Phoenician.

To Syrian builders were offered by nature exceptional forest resources on the heights of the southern and coast regions; these were the cedar, cypress and olive. Stone materials abounded in mediocre and soft limestones and in some lavas.

Chapter 1. Architecture in Canaan.

An Egyptian monument from the time of the V dynasty [1] atte-
160 sts that about the 27 th century B. C., the people settled in the region of the Jordan were already expert in military structures; the continuity of their architectural activity in t the course of the third and second thousand years, and its c clixam about the 15 th to the 13 th centuries, have been revealed by the very recent exploration of the hills of rubbish composed of the ruins of the cities of Lachish, Gezer, Tannak, Megiddo and %akarya, located from south to north at the west of the Dead Sea and of the Jordan.

Note 1. The representation of the siege of a Syrian city of the Sati by the general Anti, whose tomb is at Deshasheh.

I. Programmes and their Realization.

Architecture in Canaan was not impelled to monumental productions. The religion had no god to house and the chief portion of the worship consisted in sacrifices in the open air on a "high place". The prince's requirements was strictly li-
161 mited by the mediocre resources at the disposal of the very small states. On the contrary, on account of the frequently excessive serenity of the sky and the extreme insecurity of a country exposed to incessant internal contests and to frequent invasions by armies from Mesopotamia, Egypt and the Hittites, it had much to construct in the way of hydraulic works

[illegible]

[illegible] ... of the [illegible] of [illegible]

[illegible].

The Canaanite [illegible] -- [illegible] offices a typical example -- consisted of a sacred area (haram) defined by an enclosure; besides a row of tall stones arranged from north to south on a terrace of small stones, its surface bore [illegible] for sacrifices, a ditch and basins for offerings, a [illegible] it was considered a [illegible], a natural cavern, an artificial grotto or [illegible] chamber.

The [illegible] to be seen at [illegible] and [illegible] were subterranean. [illegible] constructed underground with a corridor for access at the [illegible] of a [illegible].

[illegible] which [illegible] and are very [illegible] by representations on the monuments [illegible] and Assyrian [illegible], by the [illegible] of the [illegible] temple of [illegible] at [illegible], and finally by the excavation of t[illegible] resistance -- by the doubling of [illegible] walls with protected cases ([illegible], 6) and preceded by ditches with walled counterescarps, by the erection of citadels, and by the [illegible] of flanking the walls by towers and bastions. (100, 3, 4, 5).

(i) Construction

[illegible] from sun dried bricks, square or [illegible] in form, [illegible] ins. long and 4.7 to 5.7 ins. thick, they [illegible] the stone, that they [illegible]; [illegible] are [illegible], they used roughly dressed rubble joined with a mortar of mud or of lime mixed with small [illegible];

[illegible]

and fortifications. Indeed, in considerable number remain c cisterns, wells, tunnels and the ruins of the walls of cities and of fortresses.

The Canaaanite temple (bamoth)-- that of Megiddo offers a typical example -- consisted of a sacred area (haram) defined by an enclosure; besides a row of tall stones arranged from north to south on a terrace of small stones, its surface bore an altar for sacrifices, a ditch and basins for offerings, w while beneath it was concealed a cavity, a natural cavern, an artificial grotto or built chamber.

The tombs to be seen at Gezer and Megiddo were subterranean, composed of a sepulchral chamber excavated in the rock, or c constructed underground with a corridor for access at the bottom of a circular well.

Most honor to Canaanite architecture results from works for fortification, which show ingenuity and are very remarkable for the time. Their system, as revealed by representations on the monuments commemorating Egyptian and Assyrian campaigns, by the triumphal entrance of the funerary Temple of Ramses III at Medinet-Habou, and finally by the exploration of t the mounds in Palestine, comprised from the third thousand y years, not only a considerable strengthening of the passive resistance -- by the doubling of crenelated walls with protected bases (102, 2) and preceded by ditches with walled counterscarps, by the erection of citadels, and by the arrangement of guarded entrances with crooked passages (100, 1, 2; 101) -- with again the organization of an active resistance by means of flanking the walls by towers and bastions.(100, 3, 4, 5).

II. Construction.

The methods of Canaanite constructors present great analogies to those of Hittite architecture of southern Syria. Although for a considerable structure they preferred for economical reasons crude and dried bricks, square or oblong in form, 14.2 to 21.2 ins. long and 4.7 to 6.7 ins. thick, they freely employed the stone, that they possessed in abundance; from t the 15 th century, they used roughly dressed rubble jointed with a mortar of mud of of lime mixed with stone chips; about the 10 th century was manifested a tendency to the cutting of prismatic blocks of average dimensions and to a leveling of

the courses. The walls were built vertically on a widely spread foundation, consolidated by wooden ties embedded in the mass;[1] if built of bricks, they always rested on a stone base, forming two or three courses with a total height of 3.3 to 4.9 ft. (102, 1, 2).

Note 1. Ancient Palestine was certainly better wooded than is the present country.

The isolated support was in current use, constructed of a wooden post set on a stone base.

From the third thousand years, Canaanite construction employed the vaulted covering; this consisted of domes -- at first erected by corbelling (102, 3), and at least from the middle of the 15 th century, as shown by the tombs of Megiddo, by radial jointing; or in tunnel vaults, examples of which e exist at Gezer, that may be dated from the 11 th or 10 th century.

Until this time, nothing reveals in what measure and by what means this architecture sought for effect; it doubtless made use of plastering and of wooden wainscoting.

In brief, what we know of Canaanite architecture presents qualities in arrangement and in construction, doubtless developed under Mesopotamian and Hittite influences.

Chapter 2. Architecture in Phoenicia and Cyprus.

The area of Phoenician architecture comprises three parts; a native country, a narrow strip of maritime Syria with the rich and strong cities of Tyre, Sidon, Byblos and Arad; a field of extension composed at one side by colonial dependencies, of which the two principal were the eastern portion of Cyprus with flourishing or illustrious cities like Kitios, A Amathonte and Paphos, and Malta in the distant west, the coasts of Sicily (Eryx), Sardinia (Suloi), the Balearic isles, northern Africa, the domain of the Carthaginian empire as far as beyond the straits of Gibraltar; finally by the adjacent region of Judea.

Established on the Syrian coast from the third thousand years B. C., the Semites of Phoenicia were entirely devoted to commerce and maritime life before the middle of the next thousand years. About the middle of the 11 th century B.C., they enjoyed rare prosperity, which lasted until about the 9 th century, an epoch in which they found strong competition in the eastern Mediterranean by the Ionian cities of Asia Minor, and in the western by the Grecian cities of Sicily and of Italy. Yet about 800 B. C. is placed the founding of Carthage.

I. Human and Natural Conditions; Monumental Chronology and Topography; Dependence and Radiation.

The civilization that supported Phoenician wealth was brilliant, but its architectural expression could only be secondary. Besides that its population was sparse, all devoted to the sea and for a great part half nomadic over the extent of the Mediterranean, the practice of Phoenician rites, like those of the Semites in general, did not require edifices. Yet the Phoenician architects distinguished themselves by considerable works of civil and military engineering -- the ports and fortifications of Tyre, Sidon and Carthage, and by the c creation of great sanctuaries like those of Melkart at Tyre and Gades; those of Baal, Echmoun and Tanit at Carthage;[1] those of Astarte at Sidon, Byblos, Amathonte and Paphos in t the island of Cyprus and on Mr. Eryx in Sicily; finally by t the erection of important funerary monuments, such as those of Amrith. To these properly Phoenician productions it is

[illegible] by the ca-
[illegible] of a [illegible] David, and the construc-
tion of [illegible] in the reign of his son Sol-
omon. For the [illegible] of Jerusalem -- the palace of
David and Solomon and the Temple of Solomon -- were executed
"under direction" by Hiram, the King of Tyre.([illegible]) [2]

[illegible]

Note 2. The temple was destroyed by a lieutenant of Nebuchadnezzar [illegible]. After the end of the Captivity of Babylon, a new temple was built, inferior to the former.(516). In its [illegible] destroyed at the time of the fall of Jerusalem in 70).

The descriptions of the [illegible] by the historian Josephus have preserved its description. See further, page 197, Note.

The Phoenician school of architecture was developed under [illegible] and the workmen from Tyre and Sidon actively contributed to the construction of some of their celebrated temples and their decoration [illegible]

[illegible] the XVIII and XIX dynasties.

II. The Phoenicians and their Civilization.

A [illegible] for a Phoenician temple was very simple: a pre-[illegible] surrounded or not by porticoes and formed a [illegible] before the entrance, and placed at the [illegible]

[illegible]

Compare the arrangement of the Phoenician temple with that [illegible] block of the [illegible] at the centre.

Yet it was susceptible of extension by the inclusion of certain elements, an illustrious example of which is offered [illegible]

The court is there divided into an outer court and a "Hatser"

proper to add those occasioned in the 10 th century by the establishment of an Israelite kingdom by David, and the accession of an ostentatious sovereign in the person of his son Solomon; for the great structures of Jerusalem -- the Palaces of David and Solomon and the Temple of Jehovah -- were executed "under contract" by Hiram, the king of Tyre.(969-936) [2]

Note 1. Of Punic Carthage no authentic remains exist.

Note 2. The temple was destroyed by a lieutenant of Naboukodonosor in 588. After the end of the "captivity of Babylon, a new Temple was built, inferior to the former.(516). In its turn this was replaced by a magnificent edifice conceived by king Herod and erected frog 18 B.C to 64 A.D. The last Temple disappeared at the time of the ruin of jerusalem in 70).

The Antiquities of the Jews by the historian Josephus have preserved its description. See further, page 167, Note.

The Phoenician school of architecture was developed under the double influence of those of Mesopotamia and of Egypt,[1] and the exports from Tyre and Sidon actively contributed to the diffusion of some of their relief forms and their decorative motives in Asia Minor, and in the Egean world.

Note 1. Phoenicia was conquered by Egypt in the time of t the XVIII and XIX dynasties.

II. The Programmes and their Realization.

A programme for a Phoenician temple was very simple; a great court was surrounded or not by porticos and formed a sacred area (haram), on which rose an altar for sacrifices and a tabernacle before the entrance,and placed at the east stood a pair of columns.(105, 1, 2, 3). [2]

Note 2. At Amrith the court formed a rectangle 180.5 by 157.2 ft.; the tabernacle was a niche cut on a cube measuring 12.1 ft. on each side, set on a base 9.8 ft. high and accessible by steps.

Compare the arrangement of the Phoenician temple with that of the Sanctuary of Mecca, which presents a court with the b block of the Caaba at the centre.

Yet it was susceptible of extension by the duplication of certain elements, an illustrious example of which is offered by the Sanctuary, that Solomon erected at Jerusalem.(106). The court is there divided into an outer court and a "haram"

with altar. The tabernacle, the house"where Jehovah had promised to dwell among the children of Israel", was dèvided like a dwelling; it comprised successively from east to west a vestibule (elam), a hall (hekal) with the altar of perfumes, the candlestick with seven branches, the table of shew-bread, and finally a holy of holies (debir), the shelter of the ark of God; in bried the arrangement of a Hittite "hilani"! Along the longer sides and the rear rose three stories of little cells extending to mid-height of the facades, and above w which were pierced windows.[1]

Note 1. The dimensions were a total of 70 cubits for the length (105 ft.), 10 for the vestibule (17.2 ft.), 40 for the hekal (69.0 ft.), and 20 for the debir (34.5 ft.); 20 cubits for the width (34.5 ft.) and 30 cubits for the height (51.6).*

The Temple of Herod measured 6 stadions in perimeter (more than 3600 ft.). The eèxternal court, called the court of the Gentiles, was bordered on three sides by a double portico and at the south by a basilica with three aisles. A low wall 3 cubits (5.2 ft.) high outlined the haram proper, that was reached by a stairway of 14 steps. In its turn it was divided into a forecourt enclosed by buildings and by galleries to w which the women had access (women's court), and a rear court termed the court of Israel, likewise surrounded by halls and porticos. Then was the court of the priests,in the middle of which rose the altar of burnt offerings. At the west of the altar was a terrace 9 cubits (15.5 ft.) high, which supported the House of Jehovah, rebuilt in white marbel as Solomon had designed it.

"When the rays of the rising sun fell on the sheets of metal covering the gates and the roof of the sanctuary, when they lit up the gilding of the facade and the colossal golden vine, which coiled on the white marble of the vestibule, the dazzled eyes must be turned aside", says Josephus, - -"and t the stranger perceiving the Temple from afar, believed that he saw a mountain covered by glittering snow". (See De Vogue, the Temple of Jerusalem).

As it appeared on the conventional representation presented on a coin, the Temple of Paphos consisted of a court enclosed

by a balustrade and of a columnar sanctuary, its entrance marked by a lofty pylon.

The programme of a palace, so far as we can imagine it by the interpretation of the descriptions of the residence of S Solomon presented by the Bible, according to oriental custom distinguishes the serail and the harem, composing the former of several rectangular columnar halls preceded or not by porticos, and of a throne or "judgement" hall. The columnar hall of Solomon measured 100 × 50 cubits (172.3 × 96.1 ft.) with a height of 30 cubits (51.7 ft.)' a series of 45 columns separated three aisles.

The construction of aqueducts, cisterns and sewers was familiar to Phoenician architects.

The location of the tombs was arranged, either in the sides of rocks in the form of artificial grottos, or in the depth of the ground in the shape of a vault accessible by a stairway or a well.(105, 4, 5). In the second case, the sepulchre was completed by a monument (1045 108, 2, 3). Sarcophaguses or "ovens" received the bodies.

III. The Construction.

At the time of their climax being possessed of iron tools, the Phoenicians were skilful carpenters. More than the Syrians of the interior, they were rapid and ingenious miners and quarrymen, not only for excavating trenches, chambers and tunnels, but likewise for sculpturing walls and even parts of edifices. Thus at the Temple of Amrith the court is a pit excavated in the rock, the base of the shrine being a block left in the solid, while at the same place an entire house was produced by a combination of excavations and reservations in t the rock!

Phoenician construction emphasizes a very pronounced taste-- further explained by reasons of a practical order -- for the use of blocks of great dimensions. Commonly, as shown by the walls of Arad, it required blocks measuring 13.1 to 16.4 ft. long by 9.8 ft. high. The ancient portions of the walls of Jerusalem exhibit such with lengths of 23.0 and even 39.4 ft with a height of 6.6 ft.(109). Yet at Baalbec is the triumph of this mode, since there in the Phoenician substructure of

the Temple are three monster monoliths, respectively 60.7, 6 63.4 and 65.0 ft. long. (107).

Sometimes, as at Baalbec, the cutting was rough; sometimes -- as the case with the retaining walls of the Temple at Jerusalem,-- it was careful, with sunken drafts around the block. (109).

The masonry was irregular and not joined by mortar; on the contrary, it comprised anchoring by layers and grillages of beams, a favorite with all the schools of western Asia.[1] The courses of the retaining wall of the Temple of Jerusalem are each set 2 ins. behind that next below; elsewhere the Biblical texts inform us, that the walls of the House of Jehovah rose in stepped form, their surfaces receding one cubit to e-each five cubits in height.

Note 1. See in I Kings, VI, 36, the passage with the description of the court of the Temple, where is the mention of three courses of stone surmounted by a layer of cedar beams.

A remarkable peculiarity of the architecture of the Phoenicians -- otherwise in harmony with the military bent of their genius -- is the use in construction of rubble of stones or pebbles connected by mortar, a favorite with the Hittite and Canaanite builders, as we have noted. Progress resulted both in the adoption of a system of building walls by casting and tamping in wooden forms, whose originality is stated by Pliny the Elder, and by replacing the mud or clay by a mixture of lime and sand; as much as to say that Phoenician masonry employed concrete.

The use of the isolated support was familiar to Phoenician architects, who made it of stone and especially of wood.

The ordinary mode of covering was by a ceiling under a terrace, but the substructure of the Temple of Jerusalem , and at the western wall of the terrace, the fragment of the arch of a bridge, with a span of more than 49.2 ft., proves that the Phoenicians knew and applied in a remarkable way the principle of the radial vault.

IV. The Effect.

In Phoenicia, the mode of construction produced a large part of the effect. That it was not indifferent to that result-

resulting from the monumental sculpture is proved by the relatively animated form of some remaining monuments and by the embryo treatment exhibited by them. (104; 110).

Certain outlines -- for example those of the tombs at Arad and at Amrith (108, 2) -- recall an Egyptian type suited to the necropolises of upper Egypt. [1] Others appear more original; such as that of a Tomb of Amrith (104; 108, 1), similar to a series of receding cylinders, the last being terminated by a sort of dome perhaps imitating the phallus, a symbol of immortality; such again as that of Kabr Hiram (108, 3) with its top in gabled form, that it repeated in tombs of the necropolis of Amathonte in Cyprus. [2] Likewise for the profiles; besides the Egyptian cavetto, a favorite crown of walls in a all epochs (110, 3, 4), and the crenelations of Mesopotamia, that appear also to have been the fashion (110, 5), the Phoenicians employed others, reproduced in Fig. 110.(1, 2, 6, 7).

Note 1. See page 79, Fig. 47, 5-7.

Note 2. A singular resemblance of the general outline of Kabr Hiram is approximated by the Tomb of Cyrus at Pasargade. (Page 398).

As for the secondary forms, the sculpture of the capital d does honor to the Phoenician-Cypriote art. It indeed comprises a certain variety of forms, some as agreeable to the eye as appropriate to the structural function of the member, and which may be referred to two types, one shaped either in basket form with geometrical outline (111, 3, 6), or in the image of an expanded flower (111, 7); the other being a more common realisation on account of the marked preference of Phoenician architecture for the square pier, presenting the appearance of a rectangular tablet supported by the volutes of two divergent lotus petals, erect or recurved (111, 2, 4, 5), or by a bouquet surmounting them.(111, 1).

Phoenician architects shared with all their colleagues in the east the passion for precious materials, brilliant colorings and sumptuous decorations. Thus they made of bronze or even of gold and of lapis lazuli,-- if we believe Herodotus-- the columns erected before the entrance to the Temple; they covered the walls with dazzling stucco, with wainscoting of

cedar, cypress and plates of metal. In the House of Jehovah at Jerusalem,"from the pavement of the edifice to the beams 113 of the ceiling - - - all was of cedar, not a stone being visible, ---" the debir being "lined with pure gold - - - even to the last detail ,- - - as far as "to the groundh6

The ornamentation comprised sculpture in very low relief or engraved. The favorite motives of the decoration were mostly of Egyptian or Assyrian origin; these were on the one hand t the lotus, winged disk, uraeus, on the other being the palm, rosette, crenelation, twisted fringe; the decorators of Phoenicia always modified certain forms, notably that of the lotus, even creating marked variants of a suitable character. (112). The Biblical texts inform us that at Jerusalem cedar was carved in knobs and garlands of flowers, and they engraved on golden coverings, not only palms and flower wreaths but also cherubim.

174 Book III. First and Second Epochs of Egean Architecture.

To the group of oriental schools just surveyed, the historian of ancient architecture finds opposed a western one, whose area extends over the West of Asia Minor from the Bosphorus as far as Cyprus (Troad, Phrygia, Lydia, Caria, Lycia); Greece, Archipelago, central Italy (Etruria) and southern Italy (Magna Grecia and Sicily).

The Egean Sea, around or near which are located these different countries, played such an essential part in their life, that its name is chosen as the title of a general presentation of their architectural productions.

The legitimacy of their united conception results from the relative community of the civilizations developed under analagous physical and human conditions, which were in relations more or less intimate, and were in different degrees subject to the same artistic influence.

Particularly during this phase of growth, all were really dependent on the East, the effect of which was further remarkably facilitated and even necessarily determined by geography. Without mentioning the certainty of their penetration into w western and maritime Asia Minor through the channel of the neighboring Hittite and Syrian civilizations, the Mesopotamian inventions and Phoenicians from the 12 th century must be disseminated afar by way of the coast, thanks to the form of the Egean region, entirely in peninsulas and islands distributed with small intervals; on the other hand the regularity of the Etesian winds, alternately directed from north to south in winter and from south to north in summer, permitted relations with the more distant Egypt.

175 Yet if this dependance and borrowing occurred, there never was a servile imitation, and the part of the ancient East in the work of Egean architectural styles particularly consisted in the contribution of efficacious ferments and of some germs, which they naturalized in their domain. Finally, they ended in the formation of an artistic personality, that in its turn radiated afar from its cradle, even reacted on the East and proposed models, whose prestige has not been lost in the twenty centuries since.

[illegible] so-called [illegible] of the [illegible] of the Hellenic [illegible], even to the [illegible] B. C. [illegible] of an artistic [illegible] the centr- [illegible] three thousand years. Since its vitality was [illegible] all the [illegible] of our era, by about the [illegible] its place in time.

The entire Greek [illegible] occupied various centres of [illegible] exercising the art of building; however, certain [illegible] are Crete, Ionian Asia Minor, Attica and Byzantium; [illegible]

Although the [illegible] history of all the [illegible] these in good measure a united and pro- [illegible]

[illegible] first [illegible] the 12 th century B. C. and is that of the production of two sister schools, the Cretan and Mycenaean, the latter a younger relative of the former, [illegible] century. This will form the subject of a first part, dividing into two chapters.

The second [illegible] about the 9 th century [illegible] of its study into two sections [illegible] architectural styles of Asia Minor and that of Attica, [illegible] 7 th and 6 th centuries B. C.; a second is devoted to the [illegible]

As for the three flowerings of the Greek styles of architecture — that formed as a function of Byzantine civilization from the 6 th to the middle of the 15 th century A. D. — we shall reserve its examination for the second volume of this work.

[illegible]

The historical development of this family of architectural styles may be carried back to the borders of the neolithic age, even to the fourth thousand years B. C. But one cannot give it the honor of an artistic production before the beginning of the second thousand years. Since its vitality was prolonged until the 15 th century of our era, by about thirty five centuries is measured its place in time.

The entire Egean region makes proof in various degrees of aptitude in exercising the art of building; however, certain privileged domains are distinguished by superior powers; at the head are Crete, Ionian Asia Minor, Attica and Byzantium; a place in the second line falls to Greece, Sicily, Magna Grecia and Etruria.

Although the collective history of the two first epochs of Egean architecture manifests in good measure a united and progressive development, two great periods may be distinguished therein.

A first precedes the 12 th century B. C. and is that of the production of two sister schools, the Cretan and Mycenean, t the latter a younger relative of the former, not making a start until after the elder one became extinct about the 12 th century. This will form the subject of a first part, divided into two chapters.

The second commences about the 9 th century and likewise c calls for a division of its study into two sections; a prehellenic, comprising the Phrygian, Lydian, Carian and Lycian architectural styles of Asia Minor and that of Etruria, between the 9 th and 5 th centuries B. C.; a second is devoted to Hellenic architecture from its beginning in the 8 th century to the extreme limit of its old age in the 3 rd century A. D.

As for the third flowering of the Egean styles of architecture -- that fulfilled as a function of Byzantine civilization from the 6 th to the middle of the 15 th century A. D. -- we shall reserve its examination for the second volume of this work.

Part I. Primitive Egean Architectural Styles.

Single Section. Cretan and Mycenean Architecture.

Chapter 1. Cretan Architecture.

By its insular conformation, that preserved it from the mi-

... of the ... and its position in the vicinity of an archipelago, at nearly equal distances, and thanks to the perfect regularity of the winds so favorably situated, within reach of Asia, Africa and of Europe; finally ... the qualities of a Greek favored for art as for industry, Greece was predestined for a brilliant prosperity and a high civilization.

Note 4. See the conclusion made in Greece by means of the [illegible] conditions to lines of an angle then the greater part of the "Nautical Sea", particularly over the Cyclades, most of which [illegible]

Greek architecture met with very favorable conditions. Doubtless it was no more bound to undertake in fortification than to works with a religious purpose; before that ins- [illegible]

On the other hand, it had to satisfy important requirements [illegible] and for funerary monuments, and particularly for habitations; princely mansions, villas and houses suited to a rich and refined civilization, a lover of comfort as much as of [illegible] ... of powerful and magnificent [illegible], and favorable ... localities of ... [illegible] ... the ornaments, ... rather chosen qualities of [illegible]

The island furnished very good earth for brick and potteries [illegible] ... and a rather coarse limestone, of clear color, which did not [illegible] construction;

miseries of war and the restraints of military domination; b by the hospitable nature of its coast and its position in the vicinity of an archipelago, at nearly equal distances, and t thanks to the perfect regularity of the winds so favorably d directed, within reach of Asia, Africa and of Europe; finally by the qualities of a people endowed for art as for industry, Crete was predestined for a brilliant prosperity and a high civilization. [1]

Note 1. See the application made to Crete by Homer of the epithet, "with a hundred cities", and that attribution by Thucydides to Minos of an empire over the greater part of the "Hellenic Sea", particularly over the Cyclades, most of which he had colonized".

I. Human, Natural and Technical Conditions. -- Influences. Cretan architecture met with very favorable conditions.

Doubtless it was no more urged to undertakings in fortification than to works with a religious purpose; before that England before the letter (anticipatory), that was Minoan Crete, there was necessary no bulwark other than its fleet, and it had no sanctuaries other than little oratories included within the palaces of its princes.

On the other hand, it had to satisfy important requirements of a civic nature, the arrangement of the sites of cities, t the establishment of roads, public works -- with an ample demand for funerary monuments, and particularly for habitations; princely mansions, villas and houses suited to a rich and refined civilization, a lover of comfort as much as of splendor; royal palaces on account of powerful and magnificent sovereigns, not favoring temporary lodgings or slight structures like the orientals, but rather durable dwellings of monumental construction.

Likewise propitious were material and technical conditions. The island furnished very good earth for bricks and pottery; its substratum had various sorts of stone, none of which indeed was very remarkable, but all of these could be utilized and one was valuable for facility in cutting; in one part being a rather coarse limestone of black color, which did not please the eye, but was very well adapted for construction;

a homogeneous gypsum, that could be cut in great blocks as w well as in thin slabs, and in varieties approaching marble or alabaster, but not resisting weather. Finally, there was an abundance of native woods, and thanks to the activity of the Cretan vessels, an opportunity to secure in Syria cedar and cypress.

In the number of favors from nature should again be counted the diversity of the climate of the island; comprising at the same time great heat, violent winds, it imposed on Cretan architecture the solution of the problems of distribution and construction entirely fitted to make it advance.

It likewise benefited from an industrial impetus, of which proofs abound, and whose memory is preserved by the legend of Dedalus; it owed to this great facilities for the execution of the workmanship; the possession of bronze tools comprising the sand saw and drill, the toothed saw,[1] axe and chisel; finally the application of rudimentary mechanics.

Note 1. One about 6.6 ft. long has been found, which doubtless served for sawing stone.

The position of Crete at a crossing of the maritime routes of the eastern Mediterranean placed it very early in regular relations with Egypt and with such advanced posts of Mesopotamian civilization, as were always Syria, Cyprus and Asia Minor, so that Minoan architecture could profit by experiments made on the banks of the Nile and of the Euphrates.

II. Monumental Topography and Chronology. -- The Epochs.

Considered in the properly artistic phase of its career, t the history of Cretan architecture covers a space of about s six centuries from the 20 th to the 15 th century B. C., in system of computation advocated by the learned discoverer of the ruins of Knossos corresponding to the "middle Minoan" epoch and to the "first and second epochs of the recent Minoan period".

The activity of Cretan architecture and its ability -- in the various parts of the art of building in the "middle Minoan epoch" -- that is from the time of the XII Egyptian dynasty in the course of the two first centuries of the second thousand years -- is attasted by the ruins of the "ancient Pal-

Palaces" of Knossos .nd of Phaestos. That first flowering w was arrested by events, that caused the destruction of those edifices.

Their reconstruction during the "third epoch of the middle Minoan period" (18 th to 17 th centuries) was the work of a matured art, to which likewise should honor be given for the great royad Tomb of Isopata on the hills of Zafer Papoura, 1969 ft. north of the Palace of Knossos. In their turn, the monuments designated by the name of the "New Palace" suffered catastrophes.

A third architectural period -- very brilliant -- correspo-nds to the two centuries (16 to 15 th) during which lasted t the "first" and "second" epochs of the recent Minoan period". From it dates the throne hall of the Great Palace, the Little Palace and the Royal Villa of Knossos; the Villa of Hagia Tr-iada, and in the same place a necropolis with an important tomb. [1]

Note 1. At Gournia in the north of the island, at Palaika-istro in the islets of Pseria and of Mochlos, that emerge fr-om the gulf of mirabello, at Philapopi in the island of Melos etc., have likewise been uncovered vestiges of Minoan archit-ecture, but very inferior to those just cited.

About 1400, in its full expansion and progress, Cretan arc-hitecture again met an overturn, that ruined all its product-ions. This was doubtless the effect of an invasion from the north of the legendary Pelasgians or rather Achaians, among whose descendants belong the Homeric heroes.

But the conquerors were related to the vanquished by commu-nity of civilioation if not of origin; for there occurred, n not a disappearance, but a slow degeneration of the "Minoan" style in the course of a period termed the "third epoch of t the recent Minoan period". Thus it becomes necessary to note as a characteristic trait of Cretan architecture the continu-ity and unity of its development.

Asia Minor (second city of Troy),which appears contemporary with the beginning of the second thousand years;the Archipel-ago (ruins of Philakopi in the island of Melos); Greece, were the theatre of architectural production synchronous with that of Crete, but which could not sustain a comparison with it.

180 181 III. Programmes and their Realization.

The programme of the Cretan palace was remarkable appropriate to the physical conditions and to the purpose of the edifice.

For the exercise of the functions of the prince, political, judicial and priestly, it provided state apartments -- indeed with very modest proportions -- with vestibule, throne, benches and sanctuary, typical specimens of which are presented by the "throne hall" in the western wing of the Palace of Knossos and by the "basilican hall" in the Royal Villa at the same place.(115, 2, 3).

The private life of the sovereign found a comfortable and pleasant location in apartments skilfully conceived to associate without confusion private life and that connected with others; no jealous isolation after the oriental custom; no secluded dwelling for women; but only as proper a frank separation of local officials, of private and common apartments, 182 and numerous communications by means of galleries, corridors, stairways, apparent or secret. At Knossos (115, 1) the arrangement comprised a hall of great dimensions -- it occupied an area of 430.6 sq. ft. --, that might be doubled by opening the doors of the antechamber, even trebled by the communication of the latter with an adjoining portico;[1] a living chamber widely opening on two small courts, one of which was separated from it by a little portico; in the vicinity being a bathroom; a little removed but easily accessible were latrines, arranged on the system of "everything to the sewer" with water supply; finally a gallery with columns provided an ample view.

Note 1. At Phaestos, this was a room with three aisles.

Cretan architecture was ingenious, and in large measure it succeeded in protecting men from heat and the excessive light of summer, as well as against the too great dampness of the rainy season.

For the halls in the ground story was adopted a system of indirect lighting by taking the light from a small court; most of these "light shafts" [2] were open from the top as indicated by making their bottom of concrete and its inclination

suited to remove rain water; they were always covered therewith, with an opening for light in their upper part.

Note 2. This is the proper term employed by the reports of Cretan excavations. On our illustrations, they are represented by cross hatching and by the letter P.

The assignment of a good average height (12.1 to 12.5 ft. to the rooms favored ventilation, while communications in the s shade was ensured by a method of surrounding the courts by p porticos about 6.6 ft. deep.

On the other hand, opportunity was given to live in the second or over the third story in apartments as comfortable as those of the ground floor, bordered by open galleries and easily accessible by commodious stairways with wide and low steps.[3] (115, 1; No. 3, 4; 122; 123). Walks facilitated in r rainy weather the passage over certain spaces without roofs. (116 J).

Note 3. Tread 17.7 to 27.6 ins.; riser 3.9 to 4.7 ins.

Care for hygiene was carried very far; a large supply of water was ensured, either-- as the case at Phaestos -- by cisterns of very remarkable construction, or -- as at Knossos -- by aqueducts made of terra cotta tubes with sockets.(117, 2). The removal of rain water and sewage was performed by a rational system of sewers, terminating in collecting sewers.(117, 1; 115, 6).

The programme of a Cretan dwelling comprised a little oratory measuring about 4.9 sq. ft., a receptacle for fetishes, vases, and of tables for libations. Doubtless one should attribute a religious purpose to the small sunken areas accessible by steps, and whose various examples in the Palaces of Knossos and of Phaestos present very similar dimensions.[1] (115, 2). Yet there exist small and better characterized sanctuaries; those revealed by the excavations of Phaestos w were composed of three small communicating halls with an annex.(118, 1).

Note 1. 8.4 by 6.0 ft.; 7.4 ft. square; 7.2 ft. square. They are generally regarded as bathrooms; but their wainscoting in a material injured by water -- gypsum or alabaster -- and the absolute lack of means of supply and removal of the fluid excludes this hypothesis.

The necessary complement of every important habitation was a considerable group of storerooms (115, 5), whose arrangement in very long cellars was appropriate for the classification of articles, while their preservation was favored by a constant temperature due to the very great thickness of the walls. The floors of some received hiding places in the form of stone coffers with average dimensions of 2.3 × 1.3 ft. with a depth of 3.9 to 5.6 ft. (121, 1).

Cretan architecture also employed schist, which was quarri-
156 ed in squares, a little imported marble, and particularly native alabaster, in the form of admirably prepared thin slabs, whose thickness never exceeded 0.8 inch for surfaces of 10.8 sq. ft. or more!

It made coatings of plaster and of stucco, prepared a cement with a hardness and adhesion equally remarkable, and possessed formulas for an excellent concrete comprising also a mixture of lime, pulverized limestone and pebbles, or of lime, clay and pebbles.

Primarily in all cases and thereafter in most, Cretan construction was a masonry of small stones, connected by abundant clayey mortar and clamped together with wood. (121, 4).

The builders of the Palace of Knossos erected their walls in two stories, superposing on a substructure of gypsum or limestone an elevation in small stones, crude bricks, or a f front of wood and earth.

The masonry of the base was very carefully executed; on so-
157 lid foundations was set a course of thin blocks forming a strongly projecting footing, that in its turn bore a very regular mass of the blocks, whose cutting has been praised. (121, 2; 114). The beds were perfectly regular, the joints always broken and sometimes alternating. The first course was higher than the others, an arrangement recalling Hittite practice (page 156), announcing a method very characteristic of Hellenic construction. (Page 292). Sometimes the setting was dry, and sometimes it comprised the interposition of a thin layer of clay mortar.

The structure of certain walls, particularly of those of t the storerooms of Knossos, exhibits care for economizing cut

... also at 1.5 in. each and ... at intervals by dis-
... the void ... filled by a mass of stones.
... form a ... ... formed by ... after
the manner of ..., ... of which are preserved by
the stone columns of the staircase at Knossos.(121, 1).

... structure made of limestone, ... which ... of the ...
... constructed by means of a frame of wood with a filling
of ..., set on a ... of gypsum.(121, 4, 5). The
... of ... ... by a frame of wood.
... the ... were ... of two ..., a ... in w
wood ..., a base in stone; ... their ... was 2.2
...
The ... of the ... varied according to the places in
...
and ..., ... of stucco, of a layer of ...
... of ... or ... of ... ...

... of gypsum or of limestone.
... 2.8 ...
... to 2.2 × 2.0 in.

... of the ... of Knossos, ...
... size, ... × ... in., supported a level of ...
... 2.0 in. in diameter. ... the ..., i
... sometimes ... of ..., ... the
... two ....

V. The ...

... architecture ... a very strong ... by a ...
...

stone. It comprises indeed two faces in blocks of gypsum 1.6 ft. wide set 3.3 ft. apart and connected at intervals by timbers let into gains; the void is filled by a mass of stones. (121, 3). Note as a curiosity, slabs joined by tenons after 148 the manner of carpentry, examples of whilh are presented by the stone coffers of the storerooms of Knossos.(121, 1).

The doorways were flanked by jambs that primitive Cretan a architecture made of limestone, and which that of the great epoch constructed by means of a frame of wood with a filling of plaster, set on a low plinth of gypsum.(121, 4, 5). The opening of a window was enclosed by a frame of wood.

Isolated supports were composed of two parts; a shaft in w wood and a base in stone; for porticos their spacing was 8.2 to 13.1 ft.

The material of the floor varied according to the place; in the courts were flags of limestone; in the light shafts was cemented concrete; in the halls being sometimes a bed of tamped clay, a coating of stucco, or a layer of cement, sometimes squares of limestone, of gypsum or again of carefully jointed schist.

Stairways received steps of gypsum or of limestone.

Roads and walks were made of two rows of jointed slabs, that measured up to 8.2 × 2.0 ft.

Aqueducts were in terra cotta; sewers were built without a covering by slabs.

The covering was by means of ceilings of woodwork; in the "basilican hall" of the Royal Villa of Knossos, main beams of enormous size, 31.5 × 23.6 ins., supported a layer of round timbers measuring 17.3 ins. in diameter. As for the roof, it was sometimes a terrace of tamped earth, sometimes a ridge w with two slopes.

V. The Effect.

Cretan architecture balanced a very strong taste by a developed feeling for harmony.

The exteriors of its edifices are too ruinous for us to correctly appreciate the effect and the success of its search f for grand monumental appearances. Yet enough remains to assure us, that it esteemed these and knew how to realize them.

It does not appear to have aimed at [illegible], the [illegible] grandeur in dimensions; no more for the [illegible] than for the elements did it aim at the colossal, the [illegible] scale of [illegible] [illegible] being the courts of honor of the palace, [illegible] at Phaestos an area of 11,[illegible] sq. ft. ([illegible] × 73.1 ft.), and [illegible]

[illegible]

[illegible], shown by its system of forming the site of the palace in terraces; of constructing monumental portals -- at Knossos an [illegible] bordered by a double portico, and at Phaestos a grand flight of steps [illegible] 44.[illegible] ft. wide, leading to a [illegible] front is the establishment of great staircases and [illegible] arrangements like that of the [illegible] at Knossos, and particularly that of the "[illegible] hall" in the Royal Villa at the same place, with its distribution -- like that of a basilical church -- into a vestibule, a nave and a choir isolated [illegible]

The care of attention and symmetry, that obtained for Cretan architecture the effects of harmonic order, is [illegible] and measured by the choice it invariably made of a [illegible] for [illegible] as for [illegible]; by its custom of [illegible] the [illegible] to [illegible] of axes [illegible] very [illegible] to [illegible] was and again by the symmetrical regularity of its [illegible]

Without having [illegible] for either [illegible] region, Cretan architecture [illegible] did not fail to [illegible] realize [illegible] by the [illegible] [illegible] and [illegible] the internal stairs (Fig. [illegible]: 1, [illegible]), the [illegible] of a wall formed by [illegible]

[illegible] on the isolated [illegible].

[illegible] was composed of a shaft between base and capital. The former was [illegible] circular, sometimes cylindrical, 0.[illegible]

[illegible]

[illegible]

irregular of course (Fig. 1, 9: 128). The existing representa-

It does not appear to have sided with those, who produced grandeur in dimensions; no more for the whole than for the elements did it aim at the colossal, the most ample of its c conceptions being the court of honor of the palace, realizing at Phaestos an area of 11,163 sq. ft.(162.5 × 73.1 ft.), and at Knossos one of 18,880 sq. ft. (198.5 × 95.1 ft.).

On the other hand, it was pleased by picturesque arrangements, shown by its system of forming the site of the palace in terraces; of constructing monumental portals -- at Knossos an avenue bordered by a double portico, and at Phaestos a grand flight of twelve steps 44.3 ft. wide, leading to a further p proof is the establishment of great stairways and theatrical arrangements like that of the throne hall at Knossos, and particularly that of the "basilican hall" in the Royal Villa at the same place, with its distribution -- like that of a mediaeval church -- into a vestibule, a nave and a choir isolated by a screen on a parapet, and an apse with a throne.(115, 2,3).

The part of attention and sympathy, that obtained for Cretan architecture the effects of harmonic order, is recognized and measured by the choice it invariably made of a rectangular form for halls as for courts; by its custom of arranging the palace in reference to an intersection of axes respectively orientated from north to south and from east to west, a and again by the symmetrical regularity of its compositions for the facades of houses.(116; 120).

Without having carried far the search for effects of secondary relief, Cretan architecture did not fail to attempt and to realize some of them; such as those produced by the stepped parapet and slab bordering its internal stairs (115, 4; 1 122), the rough sketch of the model of a wall formed by its place on a plinth (121, 2), and particularly the shape imposed on the isolated support.

This was composed of a shaft between base and capital. The former was sometimes cubical, sometimes cylindrical, 0.6 to 2.6 ft. high with horizontal dimensions of 2.3 to 2.6 ft. The shafts, whose lower diameters appear to have been 1.4 to 1.5 ft., were sometimes cylindrical, while others were reversed frustums of cones.(124, 1, 4; 122). The existing representa-

[illegible] the excavations

[illegible]

over and of others twisted spirally. As for the capital, it sometimes consisted of a rectangular one (124, 3), sometimes of one or more slabs with connection to the shaft by a cavet- to in the form of a semi-sphere or of disks in convex slices. (124, 1, 4; 126).

Yet to the effects of ornament [illegible] the favor of ar- [illegible] architecture.

Not least to those of the material: that produced by careful cutting and accurate joinings of the stones; were easier [illegible] resulting from a facing of that gypsum-alabaster possessed by the soil is found, or a coating of fine stucco, perfectly polished; and likewise that produced by overlays of precious woods, metals and ivories.

[illegible] which in relief was rare. On the other hand, the decorative idea was assigned to a polychromy, generally very succ-

[illegible]

[illegible] frescos, [illegible] with red and a sky blue or marine blue [illegible] to which was the greater palette assigned; it likewise [illegible] and black.

[illegible]

[illegible] natural representation in a freely naturalistic or conventio- [illegible] of natural causes.

[illegible] such as a part of bull's horns or a double axe,

[illegible]

the sake of [illegible] of young trunks; very often rosettes,

[illegible]

interlacing [illegible] reversed (125, 7), and an el- ement of a very [illegible] of two [illegible] dis- [illegible] from each side of a vertical band (125, 1).

representations do not show any flutes; but the excavations of Knossos have revealed the existence of trunks with 20 grooves and of others twisted spirally. As for the capital, it sometimes consisted of a rectangular cap (124, 2), sometimes of one or more slabs with connection to the shaft by a cushion in the form of a hemisphere or of disks in convex slices. (124, 1, 4; 122).

Yet to the effects of orhamentation passed the favor of Cretan architecture.

And forst to those of the material; that produced by careful cutting and accurate jointing of the stones; more again those resulting from a facing of that Gypsum-alabaster possessed by the wall is found, or a coating of fine stucco, perfectly polished; and likewise that produced by overlays of precious woods, metals and faience.

Decoration in relief was rare. On the other hand, the greatest prat was assigned to a polychromy, generally very successful; the alabaster and stucco were tinted to give them the appearance of marble or jasper, or again they were covered by frescos, particularly with red and a sky blue or marine blue tending to green was the Cretan palette charged; it likewise bore yellow, brown, white and black.

Motives were sometimes taken from realities, sometimes invented after the general method.

In the first case, there were images of plants, animals, human beings represented in a freely naturalistic or conventional taste; terrestrial or maritime landscapes; warlike, religious or natural causes.

As for the ornamental repertory, without speaking of religious emblems such as a pair of bull's horns or a double axe, (125, 5, 6), it comprised (125) disks (125, 7; 120; 124, 3), the decorative survival of a structural appearance, that of the ends of woodwork of round trunks; very ornate rosettes, frets, spirals, chess-boards, palm leaves, imbrications, zigzags, and guilloches, an ornament very similar to a pair of interrogation marks opposed and reversed (125, 7), and an element of a very elegant frieze composed of two palmations diverging from each side of a vertical band.(125, 1).

192 Chapter 2. Mycenaean Architecture.

In the present state of historical knowledge, the area of Mycenaean architecture -- that of the civilization reflected in the Homeric poems -- comprises; on the one hand Greece, a and more particularly Argolis, Laconia, Attica, Beotia and Thessaly; on the other the Archipelago, Crete and the Troad. Therefore the name applied to it because of the importance of its remains at Mycenae and of the prestige of the capital of Agamemnon, does not appear sufficiently extensive.

It is no more satisfactory with regard to the comprehensiveness of the term, because in reality Mycenaean architecture is a branch derived from the same trunk as the Cretan, but l later and less fruitful, developed in the shadow of its elder style, from which it is always differentiated by notable peculiarities.

Yet since the name in question is hallowed by use, we shall retain it.

I. Human and Natural Conditions. -- Monumental Topography and Chronology. -- Dependence and Radiation.

Not before the middle of the second thousand years did Mycenean civilization flourish, peculiar to the Achaians, nor d did architecture begin to receive from it appeals, which were to become considerable and numerous.

Doubtless no more than in Crete were temples demanded, the worship then having no need, except for an altar in the open air with a pit for sacrifices. On the contrary, it was very much practised by powerful and wealthy princes, whose type a and customs are sketched for us by the Homeric poetry.

Note 1. See what is said in Homer of Mycenae, "full of gold" and of "splendid houses"; of Orchomenos, the capital of the Minyan dynasty, "into which flows such wealth", and where there are "so many precious things in the houses".(II. IX. 381 - 382).

And first the predominant place that war appears to have h held in their lives produced the necessity of fortifying villas and fortresses; shown by the defenses of Troy, reduced to

193 the substructures; the fortress of Mycenae, of which imposing parts still remain, particularly the Gate of the Lions; the fortress of Gla or Soulas on an islet of Lake Copais, of whi-

...which have been discovered: especially the fortress of Tiryns, celebrated by Homer for the strength of its walls, whose foundations are still to be seen to the ... of a level.

The Aegean civilization further required for their own lodging, and for that of a multitude of faithful followers and attendants, for brilliant displays and finally, for the preservation of the treasures essentially movable, a palace with annexes, courts and enclosures, of which an idea may be formed by the ruins of Tiryns.[1]

[illegible]

...ers at the east of the Parthenon, of vestiges of the palace ... [illegible] ... by "Palace of Agamemnon", less important dwellings at Phylakopi in the island of Melos; at Arcomos, in Crete etc.

Lastly, they erected substantial and monumental funerary lodgings, that are known to be by the sepulchres in the interior of the citadel of Mycenae, the great neighbouring tombs called "Treasury of Atreus" or "Tomb of Agamemnon" and the "Tomb of Clytemnestra" or "Small Tomb", the "Treasury of Minyas" at Orchomenos and other sepulchres of less interest at ... and at ... in Attica, at ... near Volo in Thessaly, at Vaphio south of Sparta etc.

Toward the middle of the 12 th century, the development of Mycenaean civilization found itself arrested by the Dorian [illegible] northern Mediterranean. A multitude from north to south inundated the Greek land, who dispossessed the Achaeans. These necessarily ceased to favour architecture to great undertakings, and their conquerors were too rough and too much occupied in the effort of their establishment for a long time to have the wish or the leisure to care for them.

Then it was not till the Hellenic epoch, in the period now concerning us, that the art of building made its complete flight. We shall reserve for the second section of the [illegible] for architecture by nature (see 25). For the present we shall limit ourselves to noting the analogy of its climate to that of Greece, from which it is distinguished only by less n

which the plan has been recovered; especially the fortress of Tiryns, celbrated by Homer for the strength of its walls, which Pausanias did not hesitate to equal to the pyramids of E Egypt.

The Achaian sovereigns further required for their own lodging and for that of a multitude of faithful followers and mercenaries, for brilliant displays and finally, for the preservation of the treasures essentially natural, a palace with a annexes, commons and storerooms, of which an idea may be formed by the ruins of Tiryns.[1]

Note 1. Let us recall the discovery on the Athenian Acropolis at the east of the Erechtheion, of vestiges of the Palace of the kings of Attica in the Mycenean epoch, the legendary "Palace of Erechtheus", less important dwellings at Philakopi in the island of Melos; at Amorgas, in Crete etc.

Finally, they desired substantial and monumental funerary lodgings, that are made known to us by the sepulchres in the interior of the citadel of Mycenae, the great neighboring tombs called "Treasury of Atreus" or "Tomb of Agamemnon" and the "Tomb of Clytemnestra" or "Small Tomb", the "Treasury of Minyas" at Orchomenos and other sepulchres of less interest at Menidi and at Spata in Attica, at Dnimini near Volo in Thessaly, at Vaphio south of Sparta etc.

Toward the middle of the 12 th century, the development of Mycenaean civilization found itself arrested by the owertsrn resulting from a great ethnic revolution, whose stage was the eastern Mediterranean. A migration from north to south precipitated the Dorians upon Greece, who dispossed the Achaians. These necessarily ceased to incite architecture to great undertakings, and their conquerors were too rough and too much occupied in the effort of their settlement for a long time to have the wish or the leisure to make up for them.

Since it was not before the Hellenic epoch, in the region now concerning us, that the art of building made its entire flight, we shall reserve for the second Section of the second Part of Book III the analysis of the conditions there provided for architecture by nature. (Page 256). For the present we shall limit ourselves to noting the analogy of its climate to that of Crete, from which it is distinguished only by less h

[illegible] and [illegible]; finally the ex-
[illegible] at that instant [illegible], which we may
[illegible] in imagining [illegible] of the [illegible], [illegible]
[illegible].

[illegible]

[illegible] on the same footing as the Orient at least as far as the tools, for in what concerns the skill of the workmanship, it seems to have been less favored.

[illegible] its close dependence on Cretan art, it [illegible] and Syria; in its turn it was to strongly influence the infancy of Grecian architecture.

II. Programme and their Realization.

[illegible] Greek temple as the [illegible] of an enclosed court, the shelter of the god and the hearth, preceded by a vestibule and adjoined by a small room.

A development of this formula composed the programme of the [illegible], such as that of [illegible] of Vitruvius.(557). At the entrance of the enclosure [illegible] of a small structure [illegible] of two por- [illegible], which bore the significant name [illegible] (Propylaion) [illegible], and it divides the court into an external and internal courts [illegible] by porticoes.

[illegible] the residence, there is clearly distinguished after [illegible], a [illegible] led to the [illegible]

[illegible]

[illegible] through a vestibule. The [illegible] (Fig. 7, Nos. 10 – [illegible]) is characterized [illegible] (Caleaoi); the small [illegible] of the proportions, by a more complex ves-

[illegible]

humidity and greater cold; the abundance of its resources and the admirable quality of certain of its rocks; finally the existence at that distant time of forested areas, which we have some difficulty in imagining by reason of the present disforesting of the same places.

With regard to technics, Mycenaean architecture found itself nearly on the same footing as the Cretan; at least so far as the tools, for in what concerns the skill of the workmanship, it appears to have been less favored.

Without speaking of its close dependance on Cretan art, it was affected by the radiation from the East, Egypt, Mesopotamia and Syria; in its turn it was to strongly influence the infancy of Grecian architecture.

II. Programmes and their Realization.

The elementary type of the Mycenaean dwelling comprised a great chamber at the rear of an enclosed court, the shelter of the bed and the hearth, preceded by a vestibule and adjoined by a small room.

A development of this formula composed the programme of the mansion of a noble or the palace of a prince, such as that of the Citadel of Tiryns.(127). At the entrance of the enclosure, it had the proportions of a small structure formed of two porches set against each other, which bore the significant name of outer gate (prothyron, propyleion) (127, 1; Nos. 4, 6; 128); and it divided the court into an external and internal courts bordered by porticos.

As for the residence, there is clearly distinguished after the oriental manner, a quarter devoted to the public and another was reserved for the private life; both otherwise were conceived on the same plan, whose essential element in depth was a rectangular hall, at the centre of which was a hearth, and which was entered through a vestibule. The part corresponding to the harem (128, 2, Nos. 10 - 15) is characterized by the addition of sleeping chambers (thalamoi); the serail by an enlargement of the proportions,[1] by a more complex vestibule divided into a columnar porch (aithousa) and an antechamber (prodromos) (Nos. 5, 6), by a larger hearth, by the erection of a propyleion at the entrance of the forecourt, a

and finally by the establishment of an altar for sacrifices at a point in it opposeti the facade of the magaron.(128,2).

Note 1. At Tiryns, the megaron of the serail occupies an area of 1238 sq. ft.

Outbuildings and storerooms adjoining the palace or cells in the thickness of the enclosing walls; cisterns, aqueducts, sewers and bathrooms were the necessary complement of a Mycenaean residence.(127, 1; 128, 1, 2).

Although closely restricted by the necessity of defense and by the topography of the locality, the plan of a strong fortress like that of Gla (128, 1) no less retained the essential arrangement of a Mycenaean palace; it clearly isolated a serail with vestibule and megaron from an entirety composed of a harem with megaron, chambers and a treasury.

Mycenaean fortification was comparatively intelligent; the enclosing wall of Troy, the citadel of Goulas, that of Mycenae, and particularly that of Tiryns show a knowledge of utilizing the natural advantages of a position, and of developing them by the erection of thick walls, sometimes with casemates, by tracing enclosures with abrupt angles, by flanking them by means of bastions or towers; by an arrangement of external a access forcing the assailant to expose his right side, unprotected by the shield, to the missiles of the garrison (127, 1, Nos. 1, 2, 3); finally by an arrangement of crooked corridors and of gateways with internal vestibules after the Mesopotamian and Hittite fashion.(1275 2; 128, 1, 2, No. 15).

Mycenaean architecture realized three sorts of funerary programmes. The first and most ancient enclosed a rectangular pit by four small walls and a covering of slabs, masking it either by a tumulus, or as the case for the royal tombs of t the acropolis of Mycenae, by a sort of covered passage in the neolithic fashion. A second comprised the excavation in the rocky side of a hill of a rectangular cell, measuring 9.8 to 16.4 ft. on a side and 6.6 to 9.8 ft. high, its upper part b being shaped like a roof with two or four slopes or as a dome, access to which was formed by a passage (dromos), concealed after the burial by a mound of earth. The third composed the sepulchre of a great chamber built with a dome beneath a nat-

natural or artificial tumuli, preceded by a vestibule, and with or without a rectangular cell at the side, accessible by a long avenue between walls, that was sometimes filled af- ter the burial and sometimes remained open. As examples of the latter may be cited the "Treasury of Minyas at Orchomenos, the Tombs of Menidi, Dimini and at Mycenae, those called the Tomb of Clytemnestra and that denominated the Treasury of At- reus or Tomb of Agamemnon, the most important of all.(128).

III. Construction.

Mycenaean architecture only employed stone for its protect- ing walls for the substructures of the dwellings of the living as a protection from the dampness of the ground, and for the entirety of the tombs, which were desired to be durable.

[illegible]

[illegible] average of 1.6 × 1.2 to 2.1 × 1.8 ft. and 0.3 to 0.5 ft.

Stone was quarried in blocks with sizes varying acc. to the nature of the rock. When soft, as in the Treas., I [illegible] reduced to the minimum the labor of cutting and the size of material by using stones of great dimensions. Some of these [illegible] monoliths. Mycenaean quarrymen succeeded in detaching from [illegible] "Treasury of Atreus" is four times as heavy, with dimensions respectively of 27.2 ft., 16.4 and 3.7 ft. (130, 31). [illegible] ing to the resistance of the blocks, their shape was irregular or tended toward that of a prism. Frequently only the [illegible]

Note 1. Either by attacking grooves or by forcing wedges into natural crevices or artificial holes, then swelling them by [illegible]

[illegible]

natural or artificial tumulus, preceded by a vestibule, and with or without a rectangular cell at the side, accessible by a long avenue between walls, that was sometimes filled after the burial and sometimes remained open. As examples of the latter may be cited the "Treasury of Minyas at Orchomenos, the Tombs of Menidi, Dhimini and at Mycenae, those called the Tomb of Clytemnestra and that denominated the Treasury of Atreus or Tomb of Agamemnon, the most important of all.(129).

III. Construction.

Mycenaean architecture only employed stone for its protecting mass for the substructures of the dwellings of the living as a pootection from the dampness of the ground, and for the entirety of the tombs, which were desired to be durable.

Its ordinary materials were earth and wood.

The former was slightly or not at all purified, then mixed with much chopped straw and moulded in squares measuring an average of 1.6 × 1.2 to 2.1 × 1.5 ft.and 0.3 to 0.5 ft. thick.

Stone was quarried in blocks with volumes varying according to the nature of the rock. When soft, as in the Troad, for example, it was cut into rather small blocks; if hard, they reduced to the minimum the labor of cutting and the loss of material by using stones of great dimensions. Many of those known to us weigh 3.3 to 4.4 tons and several are imposing m monoliths. Mycenaean quarrymen succeeded in detaching from the rock by primitive methods enormous masses; [1] the lintel of the Gate of Lions at Mycenae measures 16.4 ft. long, 8.2 wide and 3.3 thick, weighing 33.0 tons (131); that of the
199 "Treasury of Atreus" is four times as heavy, with dimensions respectively of 27.9 ft., 16.4 and 3.7 ft. (130, 8). According to the resistance of the blocks, their shape was irregular or tended toward that of a prism. Frequently only the face was dressed, and sometimes the joints also.

Note 1. Either by sinking grooves or by forcing wedges into natural crevices or drilled holes, then swelling them by wetting them.

200 Although lime was in use, Mycenaean mortar was usually mud mixed with very fine chopped straw. Terra cotta was employed for making tiles.

The Mycenaean builder consolidated a brick wall by means of a bonding of the courses by beds of mortar 0.4 to 1.2 ins. t thick and by a grillage of wooden timbers placed lengthwise and crosswise the wall a regular distances.(130, 1, 5).

Construction with small stones conformed to the same fashion.

Stone masonry termed "Cyclopean" denotes more or less skill, according to locality. Sometimes -- thus at Tiryns (130, 2)-- the material was used just as it came, the crevices being filled with small stones and earth mortar; sometimes, as on the walls of Argos (130, 3), polygonal cut stones were arranged with care and often with art, whose faces averaged 3.6 × 4.3 ft. Sometimes even -- for example at Mycenae -- (130, 4, 8), the beds were leveled without paying attention to equality of courses, to verticality of the joints, or to avoidance reentrant angles. Finally, the walls of Troy reveal the use of t the system of a mass of little stones and of mud between two faces. The covered passage of the necropolis in the Citadel of Mycenae presents a specimen of that connection of stone s slabs after the manner of carpentry, whose use we have already observed in Crete (page 188). The use of metal cramps was familiar to Mycenaean builders for joining adjacent elements, such as the abacus of a capital or a half column.(130, 10).

Note 1. So called because of a legend giving the honor of the construction of the walls of Tiryns to seven Cyclops engaged by the king Proitos.

The thickness of Mycenaean walls is considerable; at Troy it is from 11.5 to 13.1 ft.; at Mycenae from 9.8 to 23.0 ft.; at Tiryns from 23.0 to 26.3 ft.; even being 57.4 ft. in the casemate portions of the enclosing walls.(127, 1, No. 13; 132,2).

We have already observed, that normally the elevation of t the Mycenaean walls comprised a substructure in stone, above this being a mass of bricks or small stones with anchors of wood. Their ends were composed of a wooden framework and a filling of crude bricks or of earth (130, 5, 6). The surfaces composed of these materials were protected by a facing or by wainscoting.

The doorways were trapezoidal openings, with or without jambs, covered by lintels of wood or of stone, the latter being

out sections at middle [illegible], so as to increase their resistance to [illegible], and were also relieved by corn[illegible] [illegible]

[illegible] of the base of blocks at [illegible] is equivalent to an [illegible] "Treasury of Atreus" had one of [illegible] sq. ft. [1] Closure was accomplished by one or two leaves, reducing it to 5.2 ft. [illegible].

Note 1. Door of [illegible] height [illegible], width at top 9.4, at bottom 10.5 ft. [illegible] of Treasury of Atreus, height 17.7, width at top 8.4, at bottom 9.0 ft.

The isolated support was commonly constructed of a shaft of wood set on a stone base [illegible] fixed to it by means of tenons; but it was likewise made of stone.

The floor was an area of beaten earth, or of pebbles cemented by lime mortar, three layers of which were applied. A drain was formed by a course of concave and oblong tiles of terra cotta set in [illegible] trenches.

[illegible]

[illegible]

[illegible] corresponding to [illegible] of the roof an opening, whose construction is unknown.

[illegible]

[illegible], No. 8)

[illegible] span of a gallery by the artifice of corbelling the courses, seen by the casemates of the fortress of Tiryns (Fig. 8), 5 ft. [illegible] 6 ft. high -- or that of a hall forming a circle with an area of nearly [illegible] sq. ft. In the second case was obtained an ellipsoidal dome with [illegible] courses (

[illegible]

[illegible]

[illegible]

[illegible] completing the construction. They [illegible] [illegible]

[illegible]

cut thicker at middle than ends, so as to increase their resistance to breaking, and were also relieved by corbelling. (130, 7, 8; 131). They did not fear ample proportions; the opening of the Gate of Lions at Mycenae is equivalent to an area of about 102.3 sq. ft., and that of the entrance of the "Treasury of Atreus" has one of 156.1 sq. ft. [1] Closure was accomplished by one or two leaves, measuring up to 5.2 ft. wide.

Note 1. Gate of Lions; height 10.5, width at top 9.4, at bottom 10.2 ft. Gate of Treasury of Atreus, height 17.7, width at top 8.4, at bottom 9.0 ft.

The isolated support was commonly constructed of a shaft of wood set on a stone base and fixed to it by means of tenons; but it was likewise made of stone.

The floor was an area of beaten earth, or of pebbles connected by lime mortar, theee layers of which were applied. A drain was formed by a course of concave and oblong tiles of terra cotta set in masonry trenches.

As for the covering, the normal mode was a ceiling of carpentry resting on isolated supports, if necessary. [1] Likewise the existence of a central hearth in the megaron required in the corresponding part of the roof an opening, whose construction is unknown.

Note 1. Such was the group of four columns arranged about the centre of the great megaron of the Palace of Tiryns. (132, 2, No. 8)

Yet the Mycenaean builders knew how to cover in stone the span of a gallery by the artifice of corbelling the courses,-- shown by the casemates of the fortress of Tiryns (132, 2), 6.6 ft. wide and 9.8 ft. high,-- or that of a hall forming a circle with an area of nearly 1808 sq. ft. In the second case was obtained an ellipsoidal dome with three centres (132,1) [1], by the Egyptian system applied at the tombs of Abydos,[2] by a series of rings of diminishing diameters, with the filling of the last circle by a slab, dressing off the projections after completing the construction. They further proceeded economically, limiting the cutting of the vertical joints to a narrow band next the inner surface of the block and comple-

completing the extaados by filling the voids with stones and earth.

Note 1. See page 70 and Fig. 42, 7.

Note 2. At the Treasury of Atreus there are 33 rings.

As for the roof, it was sometimes a terrace of tamped earth, sometimes a gable with two or four slopes, to which there is a reference in the Homeric poems, and that is imitated by sarcophaguses in the form of a house.

IV. The Effect.

Like its elder grean sister, Mycenaean architecture loved effect, and its tastes were similar to those of the former.

Its comprehension of monumental effect is manifested in the arrangement of its palaces and its tombs. With its propyleions, doubled courts and porticor, its megaron elevated by two steps and preceded by an antechamber with three doorways and a columnar vestibule, the dwelling of the sovereign of Tiryns lacked neither appearance nor character; and a truly grand conception was that of the "Treasury of Atreus" with its avenue 114.8 ft. long and 19.7 ft. wide, its great portal with an ample opening 17.7 ft. high, its preliminary corridor, its vast domed chamber built with a diameter and height of about 49.2 ft., and finally its terraced chamber at the end of the last passage. Indeed, we shall soon see, that Hellenic architecture believed it should appropriate for its own the two essential elements of the Mycenaean programme, the propyleion and the magaron, the last being a prototype of the Grecian t temple.

It indeed appears that Mycenaean architecture had a taste for the secondary effects of monumental sculpture; but it had to reckon with its insufficient tools.

The stone masonry did not admit of relief; the walls always retained a rudiment of a modeling in projection made by their stone substructure in relation to the upper surface, in the projection of the woodwork of the roof, even the relief of t the narrow belts, though indeed small (135, 1); it was relieved on the facade by the accidental monumental portals with architraves in recessed bands, engaged columns and tablets in relief -- such as that of the "Treasury of Atreus" or that of

the Lions at the entrance of the Citadel of Mycenae.(131).

The form of the Mycenaean isolated support recalls that of the Cretan column, though more slender. Cut as an inverted frustum of a cone, the shaft was sometimes smooth, sometimes grooved by numerous flutes of small depth and almost touching, (134, 3, 4), sometimes carved or with guilloches (134,2). A base was the rule, composed of one or two disks, scarcely larger than the bottom of the shaft. As for the capital, one or two slabs were superposed, generally with plain edges, sometimes decorated by disks as at the Gate of Lions, or one or m more cushions with torus, cavetto or cyma profiles, and generally enhanced by decoration in relief.(134, 1; 131).

Mycenaean architecture had a weakness for the effects of o ornamentation.

It loved those of materials, which it demanded from the coatings further necessary for the preservation of a wall of c crude bricks; from the wainscotings also useful, of native or foreign woods; from the use of certain varieties of silicious limestone presenting the appearance of breccia, prophyry and basalt; from the use of large overlays of metal, of precious substances and of enamels, indicated both by the numerous traces of fastenings observed on the walls, and the evidence, though with the suspected truth of poetic exaggeration, of the Homeric poems celebrating the splendor of the Palace of Menelaus at Sparta, all illumined by the gleam of bronze, silver, gold, iron and amber, and that of the dwelling of Alcinous with its walls overlaid by bronze, its doors and columns plated with silver and gold.

To that passion for brilliancy among Mycenaean artists responded the love of color. They utilized the green or dark r red tints of certain of their materials; they coated the walls with white, blue, ochre and reddish brown; they executed thereon frescos, of which some fragments have remained to us; t they inlaid in them pastes of blue glass; finally, they hung them with those many colored fabrics, whose manufacture formed the chief occupation of noble ladies of that time, according to a reference to the Homeric poems.

On the contrary, doubtless because of the insufficient tools,

sculpture was little employed; the works of engraving or guilloches were found more practical, a finished specimen of these overlaid works being presented to us by the great Tomb of Orchomenos.(133).

The ornamental repertory of Mycenaean architecture was in large measure common to it and to Crete, but on the other hand, it manifested oriental influences. It is characterized by an absolute preponderance of the geometrical style and by a method of composition with a prolonged repetition of the same element. The preferred motives were the discus, the ornament in the form of two opposed and reversed exclamation marks, that we have already found in Crete (pame 191), an arrangement likewise a favorite in Cretan art -- of two palmations diverging from each side of a vertical band (135, 1, 2), and particularly guilloches, frets, spirals isolated or variously joined, rosettes, volutes, a row of squares forming a band, and chevrons.(135).

The floral decoration was reduced to lanceolate leaves, very much conventionalized, which they loved to form as a sort of collar at the bottom of the capitals (134, 2, 3). As examples of motives inspired by the sight of the human or animal reality may be cited the lions of the gate of Mycenae, conceived in oriental taste (131), and a fragment of fresco from Tiryns, that represents an episode of the combat of bulls.

Second Part, Second Epoch of Egean Architecture.

When after "lying fallow" for three centuries, the Egean region had realized the conditions for a renaissance of the art of building, this was simultaneously accomplished in the western part of Asia Minor -- in Phrygia, Lydia, Caria, Lycia, a and in Etruria in central Italy.

From the possession of iron tools resulted for these schools an immense increase in their constructive abilities.

Section First. Prehellenic Egean Architecture.

Chapter 1. Prehellenic Architecture of Western Asia Minor.

I. Monumental Topography and Chronology. -- Human and Natural Conditions. -- Influences.

PHRYGIA. -- Toward the end of the 9 th century the Phrygians, who had immigrated from Thrace two or three centuries earlier, formed a great state, that reached its climax under Tantalus and Midas, the former of legendary memory, and the latter contemporaneous with the end of the 8 th century. Their proper domain was the plateau west of the Halys, from the Black Sea and Sea of Marmora as far as the bordering mountains at the south. On the west they occupied the elevated valleys of the tributaries of the Egean Sea, and they appeared to have reached the northern shores of the coast of the latter. Very roughly treated by the invasion of the Cimmerians about the middle of the 7 th century, they were conquered by the Lydians in the first half of the 6 th century.

Prosperous and well endowed, the Phrygians made architectural productions, that three groups of ruins, which may be dated from the last third of the 7 th century and the first half of the 6 th, permit us to appreciate.

A first one is situated in the region of Sangarios and comprises rare vestiges of the Phrygian capital Gordion, and on the route from Kutayeh to Kara-Hissar are remains of fortresses, of open air sanctuaries with altars and necropolises; at the places called Ayazin, Yapouldak, Delikli-Tach, Bekchich, Pichmich-Kale, Koumbet, Doghanlou-deresi or Iasili-Kaia etc., may be seen monuments cut in the rock, sanctuaries or tombs, one of them being marked by an inscription commemorating king "Midas".

A second group is in Paphlagonia in the low valley of the Halys and at t west of that river at Iskelib and at Hambarkia, and exhibits tombs.

Northeast from Smyrna in the mountainous region of the Sipyle exist the remains of a city with a fortified acropolis, a sanctuary and a colossal idol cut in the rock, finally with tombs, the principal one passing as that of Tantalus.

LYDIA. -- Lydia had for its native land the valleys of the Hermos and the Caistre with Sardès (now Sart) as its capital. Under the dynasty of the Mermnades, who assumed the p power in 687, it rapidly increased in prosperity and in power, about the middle of the 6 th century, so as to impose its dominion or protectorate upon the entire western half of Asia Minor. Favored by nature, which had gratified them by a very fertile soil and the best route for communication between Mesopotamia and the Egean Sea, the Lydians accumulated so much wealth and lived in such luxury, that the name of their last king Croesus (561-546) has become a synonym for wealth and splendor. But in 546 at its climax, the Lydian empire was o overthrown by the rude hand of Cyrus.

Of its brilliant civilization, that dazzled the Egean world, great memories remain, but few vestiges; at Belevi on the route from Ephesus to Sardes is a great tomb beneath a tumulus; there is particularly at 7 1/2 miles north of Sardes and near Lake Coloe is a necropolis, which is dominated in height by the Tomb of Alyattes, the father of Croesus, who died in 561.

CARIA. -- In possession of the fertile valley of the Meander and of the well indented coast extending between Samos and Rhodes, finely located at the southwest angle of Asia Minor to radiate at pleasure toward Greece, Crete, Cyprus, Syria and Egypt, the Carians early devoted themselves to navigation, for whose invention tradition gives them the honor, and after the decline of Cretan power, they dominated the Archipelago for a time; they voluntarily hired their courage to the Pharaohs.

A rather crude architecture furnished them with tombs, specimens of which are preserved by the peninsula of Halicarnassus, and with remarkable fortifications, recalled by the "Wall

of the Leleges", north of Iassos.

LYCIA. -- Isolated within its wooded mountains, whose m mass extends on the southern coast of Asia Minor between the gulfs of Makri and Adalia, Lycia possessed a very original civilization at an early date. The Lycians understood how to erect fortifications, as shown by those of the position of P Pydnai at the east of Xanthos, to excavate and to cut stone; finally to construct in carpentry buildings, whose faithful and detailed image has been preserved to us by numerous stone tombs at Phellos, Antiphellos, Myra, Pinara, Hoiran, Xanthos, and at Gjiolbaschi-Trysa.

The Egean civilizations of Asia Minor were all permeated by oriental elements of Egyptian, Syrian and Mesopotamian origin. They were received both by land and sea; by contagion, so to speak, because of the vicinity of the Hittites and the Assyrians -- the former having been established in Cilicia from the middle of the 9 th century; by importation by the great commercial current, that through Carchemis, Pteria, Sardes and Miletus, carried to the Egean Sea the products of Mesopotamian industry, as well as by means of Phoenician or Ionian navigators -- the latter being familiar from the middle of the 7 th century with the ports of the delta of the Nile; it is finally necessary to take into account the frequent communications caused by political relations of Lydian princes with Assyrian and Saite sovereigns, and the regular connection of Caria with Egypt. Dependance is indicated, particularly by the Syrian tendency of the orgiastic rites practised by these races and by a marked taste of their decorators for motives dear to Egypt, Mesopotamia and Phoenicia.

Yet these peoples, those of the coast in particular, possessed proper temperaments and submitted to special physical servitudes. The cooperation of both with oriental influences c constituted the dominating character of the architectural styles of Asia Minor in the second Egean period.

II. The Programmes and their Realization.

The better known portion of their work is that with a funerary purpose. According to whether they operated in mountain regions or in the lowlands, they preferred to cut a tomb in

the rock or to construct it.

In the first case, which was common in Lydia and normal in Paphlagonia and Lycia, the monument was composed of a facade in the image of the facade of a house or a temple -- this was sometimes a blind screen and sometimes a portico -- and a cell, access to which was sometimes arranged by a flue terminating at the summit of the rock.(143, 4, 5, 6, 7).

Where the nature of the ground was opposed to the use of t the rock-cut system, is found a remarkable survival of the f forms of the neolithic age.

That the "cist"is represented in Caria by rectangular coffers in stone or terra cotta with average dimensions of 1.5 × 1.0 ft., composed of four vertical slabs and of a fifth horizontal one, forming a covering.(138, 6).

That of the dolmen beneath a tumulus appeared in the region of the Sipyle, where the Tomb of Tantalus presents a remarkable example in the form of a sepulchral chamber 7.1 ft. wide and 9.35 ft. high, occupying the centre of a conical mound of stones.(138, 1; 142, 3; 143, 1).

As for the type of the covered passage, it appears to have obtained favor in Lydia and Caria. Under an artificial tumulus, a corridor 13 to 16 ft. long and 3.3 to 6.6 ft. wide led to a rectangular cavity, whose sides averaged from 6.6 to 16 ft. and its height 9.8 ft.; its situation in the mound is central in Caria but excentric in Lydia, which permitted the carrying on in front of the work of construction and of terracing.(138, 2, 3). The tumulus was surmounted by one or more terminals imitating the phallus, a symbol of life.(143, 1). In Caria the monument sometimes occupies the middle of a circular enclosure marked by a parapet. The principal specimens of the kind are the Tomb of Alyattes near Sardes and the nameless Tomb at Belevi near Ephesus.(138, 2, 4; 142, 1, 4).

Finally, exceptionally in the region of Sipyle, frequently in Caria and commonly in Lydia, is found the tomb in the form of a small structure. In the two former regions, it consists of a rectangular chamber, in part sunk in the earth or excavated in the rock, bounded by two parapets, covered by slabs and sometimes surmounted by a monument, or again of a cell in

the mass of the rock cut into the form of a building (138, 7; 143, 8); in Lycia, the dwelling of the dead is an exact copy of the house of the living.(140, 1; 141; 143, 9).

A fortification of the type found in Caria and Lydia comprised a wall 3.3 to 9.8 ft. thick flanked by towers with battlements. The normal plan of these is rectangular; yet the "Wall of the Leleges" near Iassos was furnished with semicircular bastions.

In Phrygia were cut in the rock on "high places" altars composed of a platform in several steps leading to an area crowned by a stele or a niche.(139). A rectangular cavity formed in the slope of the rock at the centre of a front imitating a facade served as a tabernacle.(137).

III. Construction.

To the architecture of the Lydian age, Asia Minor offered resources in woods -- oak, pine and cedar -- that it refuses more and more to modern times. Hence construction in carpentry prevailed in the elevated regions, in Phrygia and Lycia; elsewhere its sway was divided with that employing earth, moulded in squares or not so.

Thanks to the tombs, as we have stated, the construction of the Lycian house is perfectly known to us.(140, 1; 141; 143,9). Two similar horizontal frames, each composed of four timbers framed together in a rectangle, one placed on the ground to form the substructure and the other being supported above the former by four posts connecting the corresponding angles, composed a skeleton whose spaces were closed by means of a filling of tamped earth, crude bricks, or of wood.

The little structure owed a very original appearance to the numerous projections of its framework and to the curved angles of some of these. The former resulted from two practices of Lycian carpentry, which on the one hand employed joining by halving, allowing the ends of the crossed timbers to project much beyond the junction (140, 1), and on the other by the lack of large timbers was forced to use doubled timbers, connecting them by means of a sort of cramps at proper distances.(140, 3, 4, 5). As for the curvature previously mentioned, it was required by a defect common to the trees of that

country, that starting on the steep slopes could only take a vertical direction after having grown perpendicular to the ground.(140, 2).

Less forested but richer in clay, Phrygia and Lydia preferred earth, that they sometimes employed for clay plastering on reeds, sometimes to erect on stone substructures with mud mortar walls of crude bricks -- like the Temple of Gordion, that was further furnished with facings of terra cotta -- sometimes of burned bricks -- as proved by the Royal Palace of Sardes.

As for stone construction, thanks to the possession of iron tools, it could produce better and to a better purpose than that of a preceding age. Indeed it was pleased by and understood stonecutting; knowing how to sculpture in the rock the whole or a part of a small structure and to impose regular forms upon its materials; more and more for the construction of the isolated support was stone substituted for wood.

215 If polygonal masonry remained in favor, it was no longer as formerly, a great pile of rough blocks, but a careful assemblage of well fitted blocks. Better still, there was a marked tendency to level the beds, even when the masonry was polygonal (140, 8); to fashion rectangular ashlars and the regulation of the courses.(140, 9; 142, 1, 2). Construction was usually executed with dry joints and without champs. [1] The desire for and the method of solid construction are revealed by the system frequently observed, of doubling the walls and the ingenious arrangement of the Tumulus of Tantalus, divided by a series of internal walls, one of which is circular and the others radiate from the centre.(140, 7).

Note 1. Yet the builder of the Tomb of Alyattes employed clamps of lead made in dovetail form.

The openings have jambs generally inclining toward each other and usually have a lintel as a covering; yet the facades of tombs teach us that Phrygia likewise practised the system of the arch, turned on stilted centres.(143; 5, 7).

216 For modest structures, thatch or bundles of reeds supplied the elements of the covering. If this were of wood, its most common arrangement was that of a ceiling of timbers and trunks

projecting much beyond the surface of the wall and bordered by a parapet to retain the earth piled on its surface.(140, 1; 142, 8). At other times, it was a roof in two slopes, whose ridge -- as we know from the representations shown by the rock-cut facades of Phrygia -- rested on supports set at the apexes of the gable walls, and at intervals by the timbers of the ceiling or on the ground itself.(137; 142, 5, 7; 143, 2, 4, 6). In Lycia was frequently employed the form of a reversed keel constructed in the shape of the bow of a vessel.(142 6; 143, 9). It was sometimes visible, sometimes masked by a ceiling.

Yet the Ægean architectural styles of Asia Minor knew how to cover an interior in stone. They employed either the system of the ceiling of slabs set beside each other, of which numerous examples are shown by the Lydian and Carian tombs; (142, 1); or that of a pile of panels successively smaller, an example of which is presented by the Tomb of Belevi (142, 2); or again that of the false tunnel vault with pointed or semicircular section, obtained by setting corbelled courses, and which was chosen for the Tomb of Tantalus and for many L Lydian and Carian sepulchres.(142, 3). On occasion was constructed a radial tunnel vault, indeed quite roughly realized in small stones, for example, that covering the corridor of the Tomb of Alyattes.(142, 4).

217 IV. The Effect.

Anxious for effect, the Ægean architectural styles of Asia Minor sometimes sought that produced by material greatness, as by the proportions of the Tumuluses of Tantalus and of Alyattes, the first measuring 110.3 ft. diameter and 82.0 to 8 88.5 ft. high, those of the second being respectively 1106.5 and 226.5 ft. The idea and a certain sense of monumental composition are recognized in the form of these masses, whose c
218 cone surmounts a constructed base, sometimes defined, as at the Tomb of Tantalus, by rudiments of a plinth and a cornice; (143, 1); likewise the elevation of the rock-cut facade is t the sketch of a type of facade, whose formula was reserved to be perfected by the Greeks. (143, 2, 4, 5, 6). Even the effects of a harmonic order were not unknown, as proved by the

arrangement of the proportions of the Tomb of Tantalus, in w whose outline may be exactly inscribed an equilateral triangle.

As for the picturesque, it is intended and obtained in the Lycian structures, which emphasize the manifestation of their framework and by the rock-cut facades of Phrygia and Paphlagonia.

For the effects of secondary sculpture, the architects of Asia Minor sought them less than those more easily obtained by drawing, engraving and color. The excavations at Gordion have revealed that in Phrygia were essentially required facings of terra cotta tiles, modeled and painted.(137; 143, 2). The relief is wanting or is barely sketched, as the case on the Tomb of Tantalus.

The types of the isolated support peculiar to the Egean architectural styles of Asia Minor exhibit both an incontestable care for the form of this member and evident borrowings from the decorative treasures of the ancient East.

The column fashioned in Phrygia and Paphlagonia -- stumpy, quite conical, with broad footing in the strong projection of a very thick torus, recalls Assyria (144, 3, 4); the same for such a capital to be seen in a tomb at Kaumbet (144, 1), while Egypt is recalled by another from the necropolis of Ayazin (144, 5) and the head of a column from Iskelib (144, 8), carved in the image of the front of a couching lion, a theme elsewhere used by the Persia of the Achemenides. A capital from Yapouldak and another from Ayazin (144, 6, 7) exhibit volutes allied with the East on the one hand, and on the other with Greece. At Ayazin, at Hambarkaia (144, 2, 4), are seen others related to the family of which the Grecian Doric is the head.

Likewise strong oriental influences are betrayed by the elements of the ornamentation of the prehellenic monuments of Asia Minor. These are palm leaves and lotus buds, rosettes and volutes (145). Phrygia liked the fret, chess-board, sawtooth, zigzag and also some scrolls (145, 12; 140,6), that recall one of the most typical elements of the capital of Persia of the Achamenides.

Yet tthere is no peculiarity of these schools more indicat-

indicative of their relationship to the ancient East, than t
220 their taste for animals, couching, facing, passing or fighting, bulls, griffins and especially lions -- dear to Mesopotamia -- and the winged sphere, so characteristic of the arts of western Asia.

Chapter 2. Etruscan Architecture.

In general the area of Etruscan civilization had as its centre a strip of the territory of central Italy extending from north to south on the right bank of the Tiber, and which contains two groups of cities:-- in the south, Tarquinii near C Corneto, Blera (Bieda), Norchia, (Caere (Cervetri) with its p port of Pyrgi, Falerii, Volsinii (Velsono), Vulci; in the north, Clusium (Chiusi) Perusia, Cortona and Arretium (Arezzo). It further comprises all the Tuscan province, ruled by the cities of Ansedonia, Vetulonia, Rusellae, Populonia, Volterra, Fesulae (Fiesole near Florence), Luna, and beyond the dorsal ridme of the peninsula, the basin of Reno and the shores of t the mouth of the Po, controlled by Felsina (Bologna), and in the vicinity at a distance of 4.35 miles on the border of the Reno, at the place now called Marzobotto, by a recently discovered city, whose name is unknown. It finally extended south of the Tiber over Latium -- adding Alatrium -- (Alatri), Alba Fucentia on the north of Lake Fucino, Rome, which was e entirely Etruscan in respect to civilization until the 3 rd century B. C., and at last during a certain time, into Campania controlled by Capua.

Between 800 and 400 occurred the brilliant period of the p political history of Etruria.

Harassed on the north by the Gauls, on the east by the Sabines, at the south by the Samnites and the Greeks, the Etruscan empire was gradually reduced to its native country. After 376 it suffered the incessant attacks of the Romans, and it was subjected at about the end of the 3 rd century.

But the ruin of the power of Etruria was survived by not o only its prosperity, but also its individuality, and it was not before the Christian era, that the latter was absorbed i into the unity of imperial Italy. Thus the duration of Etruscan architecture is computed at seven to eight centuries.

I. Human and Natural Conditions. -- Monumental Topography and Chronology. -- Origins and Radiation.

Etruria early developed an urban and industrious life. Enriched by the fertility of its soil and by the very great activity of its external commerce, more or less doubled by pir-

piracy, it permitted its princes and its aristocracy to satisfy luxurious tastes, attested by the paintings executed on t the walls of tombs, as well as by the number and the splendor of the objects of art and ornamentation spared by time. On the other hand, it had a sentiment for order and organization as well as a need of defense, which should produce the existence of civil and military engineering.

In fact, if there exists no ruin of a palace or an important house, at least the excavation of quarters at Vetulonia a and of an entire city at the place called Marzobotto near Bologna, the Cloaca Maxima (great sewer) of Rome, a work of the middle of the 6 th century, reveal thatprogrammes of city works were proposed to Etruscan architects. Without mentioning the famous Bridge of Sublicius at Rome, whose two constructions, one preceding and the other succeeding the attack of Porsenna, were their work; there still exist bridges like that of Blera (Bieda) and of the channel of Marta near Bulicane, west of Viterbo; paved roads with gutters; channels under tunnels like that of the stream of Veii called Ponte Sodo, and particularly the discharge tunnel of Lake Albano, executed by them for Rome at about the end of the 5 th century, indicate the habit of public works. Finally, the existence of an important demand for fortifications is attested by considerable remains of walls at Alatrium, Alba Fucentia, Ansedonia, Arretum, Cortona, Fesulae, Falerii, Perusia (Gate Marzia), Rome (Wall of Servius Tullius) and at Volterrae (parts of the enclosing walls and city gates) etc.

There remains little of the Etruscan temples. Their list is quickly drawn up:-- five at Marzobotto, four at Alba Fucentia; two at Rome; that of the Great Mother and that of Capitoline Jupiter, the principal sanctuary of the city; [1] others at Alatri, Cervetri, Conca, Falerii, Florence, Vulsinii etc. Yet the eminently formalist character of the religion of the Etruscans and the intensity of their superstitious devotion must be the causes of a multiplication of the demands for religious edifices, as much as the relative fragility of their construction. [2]

Note 1. The Temple of Capitoline Jupiter, whose foundations have been discovered in the gardens of Palace Caffarelli,

is known by a description by Denys of Halicarnassus and by t the represented monument. Commenced by Tarquin the Elder and finished by Tarquin the Proud, consecrated in 509, a first edifice was burned in 83 B. C.; a second was rebuilt on the same plan and was again destroyed by fire in 69 A. D.; a third was rebuilt by Vespasian and suffered the same fate: a fourth was the work of Domitian.

Note 2. Compare the numerous burnings of the Temple of Capitoline Jupiter at Rome.

Likewise for funerary architecture; Etruscan civilization proposed an ample requirement for it in adopting the belief
123 in a survival of the dead in the tomb, with needs analagous to those of the living, which produced the necessity of substantial and comfortable sepulchres, even luxurious, if one may so speak.

In fact, by hundreds or even thousands does one meet with groups of them in necropolises, frequently monumental, in the vicinity of Viterbo, Val d'Asso, Norchia, Bieda, at the gates of Cervetri, near Corneto, at Perugia (Tomb of the Velumna or Volumni), Orvieto, Volterra, Cecina, Chiusi (Tumulus of Poggio Gajella), Cortone (Tumulus called Melone), Albano (Tomb of Aruns), etc.

To the importance of the demand corresponded the abundance and qualities of the resources, that Etruria placed at the commend of the constructor. He utilized resinous trees, celebrated in antiquity for their height and straight trunks (Strabo); excellent clay; stone in abundance -- in the north being a very fine-grained sandstone of a grayish blue or yellow, one hard and the other relatively soft; in the south were ordinary limestone (travertine) and rocks easily quarried (tufa called peperino); marble (Carrara) and alabaster. Finally the island of Elba supplied iron and copper.

Let us add that this combination of propitious conditions was perfected by the aptitudes of an industrious race, well endowed in respect to feeling and artistic powers.

But what was this race?

The Grecian legend recorded by Herodotus and by Strabo placed its native land in Lydia, whence it had swarmed under the

lead of Tyrrhenos, a son of Atys; hence the name of Tyrrhenians given to the Etruscans by the Greeks. The researches of modern science resulted in the hypothesis of the confluence of two migrations into Etruria, of which that of the Rasennes was most important in numbers and came by land from beyond t the Alps, the other being superior in regard to civilization and originating in Phrygian or Ionian Asia Minor.

What appears certain -- confirmed by the peculiarities of their language, customs and religion -- is that the civilization of the Etruscans was for centuries fundamentally different from that of the Greeks, and that in many respects they recall those of western Asia. [1] It is also a fact, that their decorative repertory indicates numerous original borrowings of Egypto-Mesopotamian, common to Phoenicia, Lydia and Phrygia; that they shared with the peoples of the two last countries a marked preference for burial beneath a tumulus and a t tomb excavated in the slope of a rock with a facade; finally that the current use of the vault draws their school of architecture towards the oriental, as well as distinguishes it f from the Hellenic.

Note 1. Thus the Etrurian costume was mostly Asiatic, with a long robe sprinkled with flowers and a polychrome border, sometimes in the Lydian fashion and with a hood analagous to the Phrygian cap; that alone of all the Mediterranean peoples, the Etrurians were addicted to the essentially oriental practice of divination.

Yet the continuous commercial relations maintained by the Etruscans, if not with the Hellenes of Italy and of Sicily, their detested rivals, but at least with those of Greece and of Ionia, exposed them to an influence from Grecian art, very energetic and effective from about the beginning of the 2 nd century B. C. [2]

Note 2. Compare the active importations into Etruria of p painted Greek vases, of which the Etrurian necropolises have yielded so many specimens contemporary with the 6 th century. In brief, compared to that of Greece, the architectural works of Etruria exhibit a parallel use of an original common basis, but with less genius.

In its turn, Etruscan architecture formed a school. From it the Romans derived some of the essential elements of their art of building, among those from which modern construction has most profited.

II. The Programmes and their Realization.

The Etruscan conception of the city comprises a systematic arrangement on a regular plan. A division into four quarters resulted from the intersection of two avenues, one extending from north to south (cardo) and the other from east to west (decumanus), while these portions bear traces of a network of streets parallel to the former.

The greater streets of the excavated city of Marzobotto had a width of 49.2 ft., equally divided between a road and two sidewalks. The paving was generally carefully constructed w with slabs; at certain distances the road for wagons was crossed by a series of high blocks, in case of rain permitting passage dry-shod from one sidewalk to the other.

Cities were ensured perfect drainage by a system of channels and sewers; as an example of their installation may be cited the Colaca Makima of Rome, executed to drain the Forum, and whose width is from 9.8 to 12.8 ft.

Etrurian fortification opposed to the enemy strong crenelated walls of stone, frequently strengthened by buttresses and sometimes flanked by towers; it also comprised ditches -- such as that at Rome outside the wall of Servius Tullius; gateways with internal vestibules in Asiatic fashion similar to the Gate del Arco of Volterra, and which sometimes -- as the case of the Gate of Augustus at Perugia (147) -- opened between two towers.

According to their condition, the Etruscans inhabited simple cabins, either circular or oblong, or comfortable houses with plans known to us by a description of Vitruvius and by their images presented by tombs and cinerary urns.(148; 149, 3, 4). It formed a rectangle with its centre occupied by a little court (atrium), with a basin at its centre designed to receive the water discharged from the internal slopes of the roof. On it terminated a vestibule, lighted from it, opposed to which was a living room (tablinum) with chambers (cubicula)

at the sides. An urn discovered near Cecina appears to indicate that the elevation of the Etruscan house comprised a story with external gallery under the projection of the roof. (148, 2). The elevation of the dwelling on a high base protected it from the dampness of the ground.

Without mentioning a modest type -- further suited to a period when cremation was the custom -- which consisted in excavation more or less carefully walled with masonry, Etruscan tombs are divided into three categories.

A first is adapted to this undulating country rich in soft
228 stone, and comprises artificial grottos with or without passages for access, such as are seen in the Val d'Arno, at Norchia, and subterranean rooms accessible by a stairway, as examples of which may be cited two beautiful tombs at Cervetri, and particularly the Tomb of the Velumna at Perugia.(149, 3, 4). When insufficient consistency of the ground prevented t the convenient method of excavation, there was practised construction with vaulted covering in the mode of that revealed by the Tomb of Pythagoras near Cortona (149, 5), that of the Grand Duke near Chiusi, and that called Tomb of San Manno near Perugia.

A second group is formed by sepulchres excavated or built beneath a tumulus enclosed by a low wall and crowned by an emblem. The best known examples are the Tomb of Regulini Galassi at Cervetri etc.(149, 1, 2).

A third category, numerous specimens of which are shown by the necropolis of the Val d' Arno, is characterized by the s sculpture of the rock into the form of a monument, in the base of which is excavated a low cell with a narrow entrance. (149, 7).

Rarely were the tombs constructed under the open sky, like the small structures of the necropolis of Orvieto, and the s so-called Tomb of Aruns at Albano.(149, 6).

The house of the dead imitated as much as possible that of the living. The chambers were generally rectangular, sometimes circular or elliptical; when they were large, their ceiling was supported by a central pillar or by a number of isolated supports. Their walls were hollowed in niches with ben-

benches for depositing the bodies or urns. Some were extensive and were arranged on a regular plan.(149, 3; 153, 1, 2).

If on account of the insufficient data furnished by the text of Vitruvius and by the ruins leveled to the foundations,
119 the arrangement of the Etruscan temple remains uncertain in its details, its entirety may easily be eestored.(151; 154). Its plan formed a rectangle nearly square. (According to Vitruvius the length exceeds the width by one sixth). Orientated frsm south to north, according to the dogma locating in the north the dwelling of the gods, it was divided in length into two nearly equal parts; the front one formed a portico on columns; the rear was enclosed by walls and composed a sanctuary, generally triple, because of the Etruscan conception of a trinity, whose members were Tina, Cupra and Minerva, corresponding to Zeus, Hera and Athena. Sometimes the portico was confined to the front of the group of chapels, and sometimes it was prolonged by a row of columns along the sides; in the second case the rear wall extended to the line of the supports and was returned in the form of an ante.

Certain ruins -- thus those of the Temple at Marzabotto, of that at Florence, and of that dedicated by Rome to the Great Mother -- reveal the existence behind the sanctuary of an oblong room perpendicular to the main axis, to which may be attributed the purpose of either a sacristy or of a stairway.

The area of the temple was always elevated by a base from 1.3 to 3.8 ft. high with vertical sides and accessible by a flight of steps at the middle of the facade.(154).

III. The Etruscans were careful and skilful builders. Excellent metal-workers, [1] superior potters capable of producing perfect tiles with a thickness not exceeding 1.8 in. for a length of 3.8 ft. and a width of 2.8 ft., they were also excellent carpenters, [2] and further good stonecutters, ab-
120 le to quarry blocks of large dimensions with lengths of 6.6 to 13.5 ft.; [3] to accurately shape the voussoir of an arch, to cut a plane surface and to make a carving.

Note 1. Etruscan bronzes were famous, even at Athens.

Note 2. Proved by the success of undertakings as considerable for that period as the excavation of certain tombs and

the boring of the tunnel of Ponte Sodo (230 ft. long, 11.5 to 13.1 ft. wide and 19.7 ft. high) and the emissary of Lake Albano (39.4 ft. long, 5.4 ft. wide and 6.6 to 9.8 ft. high.

Note 3. The walls of Arretinum contained blocks 6.6 to 8.0 ft. long; certain stones in the walls of Volterra measure 10.5 ft.; the enclosing walls of Cortona show some that attain a length of 9.0 to 13.1 ft.

Even when monumental, a large part of Etruscan building was of wood, and when it was merely domestic, it was almost exclusively limited to that material. It took only two precautions against injuries by dampness of the earth and the rain; between the edifice and the ground was interposed a stone base, and the carpentry was sheltered under terra cotta coverings.

It again made free use of crude bricks.

The difference of conditions presented to the stonecutter in northern Etruria, provided with quite hard sandstone and travertine, and to that in southren, supplied with soft stones (tufa and peperino), was the cause that the masonry was n not the same in the two regions. In the former the desire for economizing labor determined a preference for great masses a and for their use with the natural polygonal shape produced in quarrying them. The cutting was sometimes rough, and on the contrary sometimes careful, and the setting tended to leveling the courses. Southern Etruria reduced the dimensions of the materials and imopsed regularity of jointing; or indeed -- as shown by the walls of Caere and the substructure of the Temple of Capitoline Jupiter at Rome -- all the stones
231
232 were of the same dimensions, or even -- as proved by the wall of the Tabularium at Rome -- there was an alternation from o one course to another, of blocks set lengthwise and others placed across the wall.(152, 5).

The custom of Etruscan construction in perfecting the continuity of a surface by means of pieces carefully fitted in t the crevices manifested both its conscientiousness and its care for economy.(152, 3). It is again a mark of attention and of foresight in its care to arrange in the walls at regular distances, vertical slots to ensure their drainage.(152,2).

Etruscan masonry did not comprise mortar; it was not before the end of the 4 th century and in foundations that occurred a jointing in lime mortar. Where the material was soft, the use of iron cramps was normal.(152, 7).

The buttress was in current use, sometimes on the exterior, sometimes on the interion, on parts of the same wall.

To cover openings, the Etruscans not only employed the methods of the lintel, of the arch formed by corbelling the courses, and also that of the radial arch; prived by the gates of Ferentinum, of Volterra, the Gate of Augustus and the Gate Marzia at Perugia, the two latter being defined by a series of 29 voussoirs.(147).

Etruscan architecture made great use of the isolated support, which it made of wood, and also of stone.

As for the covering, at the same time as various sorts of ceilings, it currently and readily employed the system of the vault.

By indications of Vitruvius confirmed by representations observed on various monuments, we know that a temple was enclosed in the following manner.(153, 4; 154). On the columns of the portico and on the longitudinal walls of the sanctuary w were placed pairs of timbers (trabes compactiles). On these were laid a second transverse series by means of beams (mutuli) projecting from the place of the facade a distance of one fourth the height of the columns.

Many Etruscan tombs teach us, that the houses, of which they were faitnful images, were covered by a pile of frames, g gradually becoming smaller.(153, 2).

As for the vault, Etruria presents specimens of all known tunnel vaults; from that produced by corbelling the courses with or without cutting off the projecting angles, even to t the jointed straight arch, of which the emissary of Lake Albano and the Mamertine Prison in Rome exhibit remarkable examples.(153, 11), in passing by the systems of corbelling with a key (153, 3, 5) and of voussoirs with or without radial beds.(153, 6 - 9). The duration of these works, some of which are more than 25 centuries old, forms a decisive proof of the mastery of Etruscan constructors.

Note 1. As ancient examples of the latter may be cited the covering of the Tomb of Pythagoras at Cortona (153, 6), those of the Cloaca Maxima at Rome, of the Tomb of the Grand Duke near Chiusi, of the Temple of San Manno near Perugia (153, 9, 10), of a bridge at Bieda (153, 8). The rise measures respectively 9.7, 12.8, 10.6, 13.1 and 24.3 ft.

They likewise understood how to construct solid and impermeable roofs. Against a ridge timber (columen) on the one hand, and on the other on plates set at the longer sides of the ceiling framework were set rafters (cantharii) in pairs, which extended beyond the face of the wall and the colonnade as much as the ceiling timbers projected from the facades. If necessary the points of support were increased by means of i intermediate timbers or purlins (trabiculae) parallel to the ridge. The inclination was relatively steep.(148, 2, 3; 154).

Sometimes directly, as attested by the sculpture in steps of the ceilings of certain tombs, sometimes by an intermediate layer of planks (templa), this roof bears a covering of e excellent flat tiles with raised edges and cover tiles on the joints.(157, 10).

234 IV. The Effect.

Etruscan monuments indicate a truly architectural conception of the effect.

It scarcely comprises the impression of material greatness. If some tumuluses are enormous -- like that called Cucumella at Vulci -- the known temples only cover restricted areas -- from 1076 to 4306 sq. ft. -- and not more than 32,293 sq. ft. were occupied by the giant of the family, the Sanctuary of Capitoline Jupiter at Rome. [1]

Note 1. These are some dimensions.

Foundations of Temple of Capitoline Jupiter, 189 by 172 ft.

Temple of Florence, 60.5 by 65.6 ft.

Temple C at Marzabotto, 78.8 by 62.3 ft.

Great Temple of Alba Fucentia, 72.8 by 42.9 ft.

Temple of Alatri, 48.5 by 26.2 ft.

That on the contrary, it considered the picturesque monumental is indicated by its mode of elevating on a base a tumulus as well as a house or a temple, the arrangement of a vast ex-

external portico to distinguish the latter, the very decorative composition of the gates of Perugia, by such an original arrangement of the Tomb of Aruns, etc. (148, 2, 3; 149, 1, 6; 154).

It is a fact, that secondary monumental relief secured more attention from Etruscan art, than any other of prehellenic a antiquity. It sought effects in masonry, such as sunken joints and chiseled drafts around rusticated bosses projecting more or less, as for example as shown by the walls of Fiesole, Viterbo, Bridge of Blera, and emissary of Lake Albano.(152, 4; 153, 11).[2]

Note 2. Compare the taste of the architecture of western Asia for this practice (walls of Temple of Solomon (109), walls of Cnidos). (194, 8).

It did not fail to define a surface by the projection of a plinth at the base and a cornice at the top; it freely modeled the mouldings, which do not lack accent and character, though a little rude and awkward.[3]

Note 3. Certain of these recall in a striking manner Phoenician profiles. (110, 6, 7).

It readily enhanced the surfaces of walls with separate bases and caps, or -- like the gates of Perugia (147) -- multi-
13½ plied them so as to imitate a gallery; it loved to enclose t the gates by a wrought band, adorned by ears at the upper angles (157, 1), etc., and it marked the springing of an arch by a projecting moulding and its face by an archivolt.(147).

The upper parts were treated in the same spirit. A crenelated cresting extended along the ridge of the temple and on the inclined sides of the pediment, which are further accented by the pointing of the acroterias at the vertex and the angles; the lower edges of the slopes of the roof further bristled with as many rows of cover tiles (157, 10), and sometimes, as indicated by a cinerary urn (148, 2), carved in scallops by the projection of the tiles or of plates of metal. T The mode of extending the rafters above the ridge shown by E many representations of Etruscan houses recalls a practice d dear to Phrygian architecture, and we have previously noted it.(137; 148, 2, 3).

See p 169, later.

in the course of the 5 th century the [illegible]

[illegible]

the beginning of the south, [illegible] it was in a way of de-

[illegible]

5 th century.

[illegible]ctivity occurred in the course of the 5 th century, favour-
ed by a lucky combination of social and political circumstances.
[illegible]
Hellenism, chiefly menaced from the East by the Persians and
from the West by the Carthaginians. Ionia of Asia Minor suc-
cumbed, and a century was required for its recovery; hence
there is found to date of its account only the construction
of a temple of Apollo at Sardis (about 460). On the contrary,
in the same year of 480, the [illegible] of Greece and of Sicily
resisted the assault with the same success, the former at Sa-
[illegible]

[illegible]
of success and a wise utilization of the victory together
[illegible], social and [illegible]
benefited by it, also [illegible] served by the
raising of some higher [illegible], impossible for the [illegible]
of their city; such as Theron at Agrigento, [illegible]
in power in 488; in Syracuse, Gelon and his son Hiero(485-
467); at Athens [illegible] Pericles in the course of an administr-
ation of thirty years.(461-429).

The efforts of the Sicilian cities were [illegible]. [illegible]
[illegible] special mention by [illegible] of the [illegible]
[illegible]
[illegible] in 408 did not allow it to continue; temples of [illegible]
[illegible]
ra (Saints", a remarkable specimen of Doric art; of Concordia
(151), one of the best preserved among Greek monuments; of
[illegible], superior in height to the largest edifices of Asia Min-
or. Then came Selinunte with its temples listed as A, E, and
[illegible]
construction was begun about 480 in the best style, but was
interrupted in 409 by the Carthaginian invasion; Syracuse [illegible]-
[illegible]

On its part, Magna Graecia glorified itself by the erection

In the course of the 6 th century was develeped the youth of Grecian architecture; still uncertain and hesitating at t the beginning of the epoch, at the end it was in a way of determining the formulas of the Doric and Ionic orders.

5 th Century.

Maturity occurred in the course of the 5 th century, favored by a happy combination of moral and political circumstances.

The two first decades were a singularly critical period for Hellenism, equally menaced from the East by the Persians and from the West by the Carthaginians. Ionia of Asia Minor succumbed, and a century was required for its recovery; hence there is found to cite on its account only the construction of a Temple of Cybele at Sardes (about 440). On the contrary, in the same year of 480, the Hellenes of Greece and of Sicily repulsed the assault with the same success, the former at Salamis and the latter at Himera.

The impulse received during the struggle, the intoxication of success and a wise utilization of the victory determined a marvellous flight, moral and intellectual. Architecture benefited by it, also becoming well served by the ardor for building of some higher statesmen, impassioned for the embellishment of their city; such as Theron at Agrigente, master in power in 488; in Syracuse, Gelon and his son Hiero(485-467); at Athens being Pericles in the course of an administration of thirty years.(461-429).

The efforts of the Sicilian cities were magnificent. Agrigente merits special mention by reason of the number and importance of its undertakings, which its ruin by the Carthaginians in 406 did not allow it to complete; Temples of the Dioscures, Demeter, Asklepios, Zeus Polieus and Hercules; of "Hera Lacinia", a remarkable specimen of Doric art; of Concordia (161), one of the best preserved among Grecian monuments; of Zeus, superior in height to the largest edifices of Asia Minor. Then came Selinonte with its temples listed as A, R, and its "Temple of Empedocles"; Segesta, with its Temple, whose construction was begun about 430 in the best stwle, but was interrupted in 409 by the Carthaginian invasion; Syracuse with its colossal Theatre, etc.

On its part, Magna Grecia signalized itself by the erection

on a promontory near Crotona, of the Temple of Hera Lacinia, a sanctuary common to the Achaian cities of Italy, of which
148 there remains only a single column, and especially at about the middle of the century, by that of one of the masterpieces of Doric architecture, the Temple of Poseidon at Paestum.(159; 200).

The metropolis would have been surpassed by its colonies in the West, if Athens had not assumed this by the advantage of quality, though with a lack of an equal number of monuments. In truth, three Peloponnesrian peoples sacrificed to architecture; before the middle of the century, the Eleans caused to be erected by their compatriot Libon the Temple of Zeus at Olympia, which was overthrown by an earthquake in the 6 th century A. D., and now shows only the first courses of its walls; The Eginetans, doubtless after Salamis, where their fleet covered itself with glory, erected a Temple to the goddess Aphaia; the Phigalians paid the cost of a Sanctuary consecrated to Apollo Epicurios at Bassae, the work of the Athenian Iktinos, who completed it about 430.(Phigalia). The former exhibits the Doric stwle, which the latter associates with Ionic. At the same epoch, the monumental group of Delos was increased by a Temple erected by the Athenians, and that of Delphi by two "Treasuries", one constructed on account of Sicyon and the other for Athens, the latter dating from the years after Marathon, and which it has been possible to restore.

During the second third of the 5 th century, Attica was an eminent country in the art of building, and the Acropolis of its capital presented the appearance of a work-yard. Exalted by military triumphs, that ensured it the leadership in the Egean Sea, enriched by the earnest practice of industry and commerce, mistress of the control of a treasury into which f flowed the tributes of subjects and the contributions of allies, favored by the possession of quarries of limestone and marble near its walls, impelled finally by a man who wished to make it "in future times the object of the admiration of t the world", to employ his own expression, Athens lavished millions on architects; on Callicrates for a Chapel of Athena N Nike, ordered about 450, and completed by a balustrade in 408 (164); on the same artist with Iktinos for the erection from

[illegible] of a [illegible] "Athena" or of Athena Pro[illegible], a [illegible] the execution of the bases of a part of his model, [illegible] the "Hall of the Virgin" (Parthenon), was endowed with an extension of glorious memory (447); of Propylaea for the construction from 437 to 432 at the cost of $2,400,000, of a triumphal entrance to the Acropolis, a marvel of art in the judgment of antiquity; of an architect unknown to us for an Odeion [illegible]; for a temple of [illegible], improperly called the Theseion, finished about 421 [illegible]; for an Erechtheion founded about 420: for a sanctuary [illegible] the Erechtheum, temple of Athena, Poseidon and Erechtheus, commenced about 420, partly burned about 406, and finished at [illegible]

[illegible]

effects of a "Telesterion", commenced by Iktinos and completed by Pericles; of a temple of Nemesis at Rhamnus, and a little temple, of a temple of Poseidon or Cape Sunion, etc.

It was at Athens in the third quarter of the 5th century, that Grecian architecture accomplished its splendid maturity. [illegible] its position on the frontier of the two great provinces of the Hellenic world, favored by the opportunity of securing as [illegible]

[illegible] sculpture in marble, the Attic school attained in the execution of details as in the arrangement of the whole, a degree of [illegible]

[illegible] of its national pride and a model for the centres of [1]

[illegible]

the architectural flowering with an intellectual flight were [illegible] *by the productions of Sophocles (about 496-406) and of* [illegible] *of Euripides (480-about 406), of Socrates (469-399). Note again "that it was contemporary with the epoch in which Athens* [illegible] *of the rallying centre for the masters of thought. It was t*

447 to 438 of a Temple called "Great" or of Athena Polias, a and that the extension of the name of a part to the whole, t the "hall of the virgin"(Parthenon), has endowed with an appellation of glorious memory (187); on Mnesicles for the construction from 437 to 432 at the cost of $2,400,000, of a triumphal entrance to the Acropolis, a marvel of art in the judgement of antiquity; on masters unknown to us for an Odeion contemporary with the Parthenon; for a Temple of Hephaestos, improperly called the Theseion, finished about 421(305; 213); for an Asklepion founded about 420; for a Sanctuary termed t the Erechtheion, common to Athena, Poseidon and Erechtheus, commenced about 420, partly burned about 406, and finished at the beginning of the 4 th century (165). Outside its walls, it also at about the middle of the century paid the cost at Eleusis of a "Telesterior", commenced by Cimon and doubled by Pericles; of a Temple of Nemesis at Rhamnus, and a little later, of a Temple of Poseidon on Cape Sunion, etc.

It was at Athens in the third quarter of the 5 th century, that Grecian architecture accomplished its splendid maturity, both in Ionic, as well as in the Doric forms. Predestined by its position on the frontier of the two great provinces of t the Hellenic world, favored by the opportunity of soaring at a time, when all problems had received nearly approximate solutions, incited to refinements by ample resources of which it disposed, and by the exceptional power of constructing everything in marble, the Attic school attained in the execution of details as in the arrangement of the whole, a degree of perfection in technics and form, which made it the undisputed queen of its national rivals and a model for the course of time. [1]

Note 1. Let us recall the exact synchronism of that splendid architectural flowering with an intellectual flight measured by the productions of Sophocles (about 495-406) and of Euripides (480-407), of Aristophanes (about 450-after 390), of Thucydides (470-about 395), of Socrates (469-400). Note again that it was contemporary with the epoch in which Athens assumed the role of sole capital of the Hellenic civilization, of the rallying centre for the masters of thought. It was i indeed about the middle of the 5 th century, that Anaxagoras

of Clazomene inaugurated within its walls the teaching of the sciences, Hippocrates of Chios that of Geometry, Protagoras of Abdera -- who was soon to compete with Gorgios of Leontinum-- that of Rhetoric, etc.

First Half of the 4 th Century.

With the 5 th century closed the heroic epoch of Grecian a architecture. The first half of the succeeding one is marked by an evident reduction of the monumental demand. Henceforth or nearly so, from the previous regular and abundant production of the West, it was exposed to repeated attacks by the Carthaginians, Etruscans, natives, and soon of the Romans. Syracure alone prospered and was beautified under Denys I. (406-367).

The Ionia of Asia Minor ended by yielding to the misfortunes produced by the Persian wars. In Greece proper, Athens was under the effects of disasters suffered during the war of the Peloponnessus; at least we can only find to attribute to it during that epoch the completion of the Erechtheion in 395, and the erection of a graceful "Tholos" in the Marmaria of D Delphi, Doric externally and Corinthian in the interior. The Peloponnessus supplemented this in a certain measure by erecting at the beginning of the century a Temple of Zeus at Nemea, its relegious centre; a Tegeion, a Sanctuary of Athena Alea, the work of the Parian sculptor Scopas; A Metroon at Olympia; particularly at Epidauros an important group of religious and secular monuments; a Temple of Esculapius, buildings for the use of pilgrims, a "Tholos", the object of the admiration of the ancients, and finally a Theatre, regarded by antiquity as the masterpiece of the kind (174), both designed by the architect Polycletus about 350. Let us add for the account of Macedonia at Palatitza, the ruins of a Palace attributable to the reign of Archelaos.

The style of these monuments, which are of beautiful quality, tends more toward greater elegance in forms and richness in decoration.

From the Middle of the 4 th Century.

This development occurred in the course of a fifth epoch, that began about the middle of the 4 th century, and it is c characterized by a displacement of the axis of Grecian archi-

architecture, transferred to the localities where it had first been, on the western coasts of Asia Minor.

The architectural demands of Greece proper remain small and modest. Athens, under the good financial administration of Euboulos (354-339), erected -- both from the plans of Philo-- the Arsenal of the Piraeus, commenced in 346 and finished in 328, one of the most celebrated monuments of Grecian architecture and one of the best known, thanks to the discovery of t the specification for its construction, and the facade of the "Telesterion" of Eleusis erected 346-311. The restorative g government of Lycurgus (334-327) was marked by the undertaking of the Theatre of Dionysos and of a Stadion for the Panathenaic games, while the intelligent self respect of a victorius choragur met the cost of the charming "Monument of Lysicrates". (334). (199). Then the demand lessened, reduced to that of small structures commemorating choragic victories, like the "Monuments of Thrasyllos (320) and of Nicias" (319). In the 2 nd century it was slightly increased by the munificence of foreigners; about 174 Antiochus Epiphanes, king of Syria, resumed work on the Olympeion, projected by Pasastratos and whose compfetion was delayed until the epoch of Hadrian; on their part, Eumenes II (197-159) and Attalos II (159-138), kings of Pergamus, each endowed the city with a superb portico. A hydraulic and solar clock, termed the Tower of Winds, was the work of Andronicos of Cyrrhos in the course of the 1 st century, and Odeion was built at the cost of Ariobazarnes II, king of Cappadocia, in the place of that of Pericles, burned in 86, closing the series of edifices preceding the Christian era.

The schedule of the monuments of the remainder of Greece a and of the Archipelago for the same epoch is no longer imposing.

The part of the 4 th century comprises at Delphi a Temple of Apollo erected between 365 and 330 to replace that of the 6 th century, overthrown by an earthquake; at Megalopolis and at Messene, structures following the founding of those two cities in 370 and 369; in the former being the largest Theatre of all Hellas and a vast assembly hall, the Thersilion; in t the second a small Temple consecrated to Artemis Laphria; at

[illegible] a sanctuary of [illegible], [illegible] [illegible] Asclepieion at [illegible] in [illegible]. a [illegible]; at Olympia, [illegible] the vicinity of [illegible] called [illegible], the circular structure termed Philippeion, dedicated by Philip II of Macedon in 338.

On the account of the 3 rd and 2 nd centuries figure especially the embellishments of Delos, that had become one of the most important maritime centers of the eastern Mediterranean; a third temple of Apollo, the largest of the group, a Propylaea, a Portico, the gift of Philip V of Macedon (about 200), and a similar portico under the shelter of one of its [illegible]

[illegible], but which owes to the form of its capitals its name of

[illegible] of [illegible] in the second half of the 2nd century; the monuments on Samothrace, the Arsinoeion and the Ptolemaion, the first erected by the daughter of the Ptolemies, the second by Ptolemy II, and the temple of Zeus Sosipolis at [illegible]

beginning of the 2 nd century and forms a precious document for the history of art.

On the other hand, Ionian Asia Minor and the Hellenized countries after the conquests of Alexander and his successors were characterized by the number and importance of the temples, some by the cities and others by the sovereigns.

From the first quarter of the 4 th century dates the "Monument of the Nereids" at Xanthos in Lycia, a mausoleum constructed for the prince of that locality. A replica is remarkable for the grandeur of the dimensions and the quality of the sculptures, going back to the second half of the century. It comprises with the famous Mausoleum at Halicarnassus, the tomb of Mausolus, satrap of Caria, the work of Pythios between 362 and 350 (353); it coincides with a second creation of the same architect, nearly contemporaneous and equally famous, a Temple of Athena Polias at Priene (340), and with a S- [illegible] of the same name, erected on the Acropolis of Pergamon." It comprises two colossal edifices; the second Artemision of Ephesus, built in the third quarter of the 4 th century by Paeonios of Ephesus, assisted by one named Demetrios;

Lycosura a Sanctuary of Despoina, common to all Arcadia; at Eretria in Eubea, a Theatre; at Olympia, an inn for visitors of distinction called Leonidaion, the circular structure termed Philippeion, dedicated by Philip II of Macedon in 336.

On the account of the 3 rd and 2 nd centuries fiqure substantially the embellishments of Delos, that had become one of the most important Maritime emporiums of the eastern Mediterranean; a third Temple of Apollo, the largest of the group, a Theatre, a Portico, the gift of Philip V of Macedon (about 200), and a singular edifice under the shelter of one of the seven wonders of the ancient world, the "Horned Altar of Apollo", and which owes to the form of its capitals its name of
213 "Hall of the Bulls"; the Propyleion called "southern", the g gift of Athenians in the second half of the 2°d century; two monuments on Samothrace, the Arsinoeion and the Ptolemaion, the first erected by the daughter of the Lagides, the second by Ptolemy II, and the Temple of Zeus Basileus at Lebadeia (Livadia) in Beotia, whose building contract was made at the beginning of the 2 nd century and forms a precious document for the history of art.

On the other hand, Ionian Asia Minor and the Hellenized
214 countries after the conquests of Alexander and his successors were characterized by the number and importance of the demands, some by the cities and others by the sovereigns.

From the first quarter of the 4 th century dates the "Monument of the Nereids" at Xanthos in Lycia, a monumental tomb prepared for the prince of that locality. A series is remarkable for the grandeur of the programmes and the quality of the productions, doing honor to the second half of the century. It commences with the famous Mausoleum at Halicarnassos, the tomb of Mausolus, satrap of Caria, the work of Pythios between 353 and 349 (186); it continues with a second creation of the same architect, nearly contemporaneous and equally famed, a Temple of Athena Polias at Priene (220), and with a S Sanctuary of the same name, erected on the Acropolis of Pergamus. It comprises two colossal edifices; the second Artemesion of Ephesus, built in the third quarter of the 4 th century by Paeonios of Ephesus, assisted by one named Demetrios; the Temple of Apollo at Didyma near Miletus, whose plans were

[illegible]

divided by [illegible] Aegean Sea, and which was [illegible]

[illegible]

by the erection of the Long Walls to the [illegible]

of the city by the [illegible] in 451; [illegible] of

[illegible]

construction of the [illegible] and [illegible]

Delos on account of [illegible], II (89-87).

The [illegible] of the [illegible] saw the erection at [illegible]

[illegible] of a temple of Artemis [illegible]; at [illegible],

a temple of Dionysos; at [illegible], a sanctuary of Asclepios;

[illegible]

and [illegible] Delphi.

[illegible] of the [illegible] more [illegible] by

[illegible], the capital of the Attalids,

which under the government of [illegible] (197-159) was [illegible]

[illegible] but [illegible]

[illegible] activity; the memory of this is

preserved by a great Altar consecrated to Zeus and to Athena.

[illegible] may cite as dating from the end of the 2 nd and the begin-

[illegible]

temple of [illegible], [illegible], Gymnasium etc.

Under the influence of Asiatic [illegible], this original [illegible]

[illegible] developed decidedly in the sense of [illegible]

[illegible] of striving the imagination.

[illegible] from it a search for material grandeur, real or

apparent, [illegible] and richness of decoration,

[illegible] of the Doric style in favor of

the Ionic, [illegible]

[illegible] of the quality of the elements to the gen-

eral appearance; [illegible] more of this period of

[illegible]. Yet the level of the production of the

[illegible] remained very high.

[illegible]

In [illegible], particularly in Asia Minor during the first two

centuries A. D., [illegible] works as [illegible] the Temple

of [illegible], the Temple of [illegible] at [illegible]

(I st century), [illegible] particularly the

devised by the same architects before 334, and which was abandoned unfinished in 41 A. D.(239). The list must be extended by the mention of the great works at Alexandria: the planning of the city by the Macedonian Deinocrates in 331; erection of the Museum and the Library under Ptolemy I Soter (323-285); construction of the Mole and the Lighthouse by Sostrates of Cnidos on account of Ptolemy II(285-247).

The last third of the 3 rd century saw the erection at Magnesia on Meander of a Temple of Artemis Leucophryne; at Teos, a Temple of Dionysos; at Tralles, a Sanctuary of Asklepios; the two first works by Hermogenes and the third by Arcesios, two masters equally celebrated.

The first half of the 2 nd century was made illustrious by the embellishments of Pergamus, the capital of the Attalides, which under the government of Eumenes II (197-159) was not o only one of the centres of Hellenic civilization, but likewise a centre of architectural activity; the memory of this is preserved by a great Altar consecrated to Zeus and to Athena. We may cite as dating from the end of the 2 nd and the beginning of the 1 st century; at Alinda a curious portico bazaar; at Labranda in Caria, a Temple of Zeus Stratos: at Aizani (Chayder Hissar), a very remarkable group, comprising a grand T Temple of Zeus, Theatre, Stadion, Gymnasion etc.

Under the influence of Asiatic genius, this oriental branch of architecture developed decidedly in the sense of effects capable of pleasing the eye and of striking the imagination. There results from it a search for material grandeur, real or apparent, for picturesque reliefs and richness of decoration, that causes the proscription of the Doric style in favor of the Ionic, which in its turn is competed with by the Corinthian; the sacrifice of the quality of the elements to the general appearance; finally infractions more or less serious of architectural logic. Yet the level of the production of the 4 th century remained very high.

Thanks to the "Roman peace", Grecian architecture continued to flourish, particularly in Asia Minor during the first two centuries A. D., producing works as remarkable as the Temple of Rome and Augustus at Ancyra, the Temple of Aphrodite at A Aphrodisias (1 st century), of monuments and particularly the

Theatre of Aspendos in Pamphylia (176; 177), those of Temenos in Pisidia and the Trajaneum of Pergamus. Until the 3 rd century, it maintained its empire over southern Syria, according to locality, being more or less affected by Roman or oriental influences. But from the 2 nd century, it manifested a tendency to heaviness and overloading, and it had degenerated in the 3 rd century.

In Greece in the same period -- excepting the Olympeion of Athens, finished a little after 130 (166), -- architecture w was only occupied with secondary needs; the erection at Athens at the extreme end of the pagan period, of a small circular Temple of Rome and Augustus; of the Tomb of Philopappus ((about 115); of the Arch of Hadrian; of an Odeion at the cost of Herodes Atticus (after 161), the construction at Salonica in the 2 nd century, of a Basilica, whose ruins are named the Incantada.

[illegible]

In the first case, it was sometimes crowned by a capital, sometimes furnished with base and capital, or adorned dis- [illegible] occasionally ornamented by an arrangement of concentric grooves- [illegible] volute convolution. (186, 5).

After the sack of [illegible], the art of Etruria at first [illegible] and Greece; later and without losing its individuality, it was in good measure inspired by Hellenic works, whose legends were reproduced by the artists on Etruscan vases. (186, 7, 12).

Note 1. For example, on a vase of the 4th century found [illegible]

The Etruscan column was always provided with a base, that above a circular or square plinth formed a broad heavy footing, either a sort of torus [illegible] or a series of discs moulded [illegible] columns [illegible] have been quite slender, as occurs with the [illegible]. It was occasionally fluted [illegible] and [illegible] like a candelabrum. (186, 1, 8, 18).

As for the capital, the Etruscans have invented three varieties corresponding to [illegible] Doric, Ionic and Corinth- [illegible] and is composed of a disc and a cushion joined to the trunk by a cove and annulets, or by a series of flat or convex rings. (186, 1). The second was composed of a pair of [illegible] or [illegible] vertical and [illegible] inclined; [illegible] in [illegible] oriental taste or a [illegible]; in the case of the [illegible] [illegible] by [illegible] figures, [illegible] which was a [illegible] of a [illegible] (186, 8, 10, 11).

The [illegible], as we have seen, [illegible]

216 On the isolated support Etruscan architecture imposed the form of a pier or a column.

In the first case, it was sometimes crowned by a capital, sometimes furnished with base and capital, or sometimes without either; its faces were generallyfluted (156, 7, 10), occasionally ornamented by an arrangement of concentric rectangles open at the base, examples of which are presented by Egyptian decorationre(156, 3).

As for the shape of the column, the art of Etruria at first drew from the same sources as those of Phrygia, Lydia, Ionia and Greece; later and without losing its individuality, it w was in good measure inspired by Hellenic types, whose images were represented by the paintings on Grecian vases.(156, 7, 12).

Note 1. For example, on a vase of the 6 th century found in a tomb at Chiusi -- the "Francois vase" -- see the careful representation of edifices in the primitive Doric style.

The Etruscan column was always provided with a base, that above a circular or square plinth formed a broad wavy footing, either a sort of inverted bell or a series of disks moulded as toruses or coves. The shaft was sometimes made smooth and sometimes fluted, appears to have been quite slender, as occurs when the material is wood. It was occasionally frankly conical and often swelled like a baluster.(156, 1, 6, 12).

As for the capital, the monuments have revealed three varieties corresponding to those termed Doric, Ionic and Corinthian in the architectural works of Greece. The first is called Tuscan and is composed of a slab and a cushion joined to the trunk by a cove and torus, or by a series of flat or convex rings.(156, 1). The second was composed of a pair of divergent volutes, sometimes doubled vertically, generally more or less vertical and rarely inclined; between them was sculptured a palmatium in oriental taste or a flower; in the case of the second arrangement, the last motive often enhanced the middle of the band connecting the scholls.(156, 5). The third sort used a kind of scrolled crockets, sometimes adorned by recurved flowers, between which was a palmatium or a projecting head.(256, 2, 10, 11).

An Etruscan colonnade, as we have seen, did not support a

stone entablature susceptible of a form analagous to that co-
237 mposing the Hellenic frieze. Yet the bands forming the ceramic covering of the wooden architraves sometimes recall the Doric style by an alternation of more or less fanciful triglyphs and rectangular panels relieved by a rosette or head.

The Etruscan mode of treating terra cotta construction favored a development of the polychromy and of ornamentation.

It is a fact, that terra cotta facings were all polychrome, -- and as shown by the walls of the tombs -- that the walls were covered by paintings applied, either directly on a stone
238 surface or on a fresh coating of lime and sand. The palette of the decorator of pottery was charged with a yellowish white, yellow, red and black; that of the painter with the same coloßs and also with blue, green and brown.

Doubtless in this country, where artistic metal-working was so brilliant, overlays of metal had their place in architectural decoration.

If not always, at least often, the tympanum of an Etruscan temple was animated by figures in terra cotta fixed by nails to the wooden panels forming the background. Specimens of t these exist, coming from Luna and from Civita Alba.

Etruscan decoration employed conventionalizations of oriental plant origin, such as palm leaves, lotus buds or flowers, figured separately or in a group;(156, 5; 157, 2, 8; 150), r rosettes daisies, lanceolate leaves, and also frets, fret bands, eggs, heart leaves and interlacings of Hellenic importation.

In the number of favorite motives of Etruscan decoration a are counted human or animal masks, heads of men and women, of Medusa, of lions, genii and of monsters, winged sphynxes in Phoenician taste, and images of deities. (150; 156, 4; 157, 10).

SECTION II. EGEAN HELLENIC ARCHITECTURE.

From the 8 th century, the Grecian cities planted along the western coasts of Asia Minor-- Phocea, Chios, Lesbos, Teos, Ephesus, Samos, Miletus, Halicarnassus and Cnidor, were in f full flower, particularly Miletus, which rivaled Tyre as an international market and formed a glowing hearth of literary, philosophical and scientific culture.[1]

Note 1. In the decline of the 7 th century, Miletus contributed to the founding of Hellenic science, thanks to the labors of Thales and Anaximenes; in the same epoch, Colophon could pride itself on Xenophanes.

On the other hand, the promulgation of the laws of Lycurgus about the end of the 9 th century, the establishments of the Olympiads in 776, the founding of Syracuse by the Corinthians in 734, and that of Tarentum by the Lacedemonians in 707, indicated for Greece proper and its extension eastward, the beginning of a period of order and energy.

From the succeeding century began an architectural production, which was to develop, at least in certain regions, until the decline of the antique world.

Its area, of which Athens was the ideal centre, comprised three regions of invention and a vast field of expansion:-- on the one hand the western coast of Aria Minor and the islands before it, Greece proper at the south of a line joining t the gulf of Ambracia with Thermopyle, Southern Italy south of the latitude of Naples; on the other, the region bordering t the Egean Sea on the north, Asia Minor, Armenia, Syria to the frontiers of Arabia, Cyrenica, Mesopotamia, Persia, central Asia (Bactria, Sogdiana, Drangiana, Arachosia), Himalayan Asia (Cashmere), the upper basin of the Indus (Gandhara); finally in a certain measure, the entire extent of the Roman empire.

Our knowledge of Grecian architecture comprises enormous g gaps and a considerable portion of hypotheses; for most of t the monuments, we are ignorant, both of the precise date of their erection, and of the exact formation of their upper parts; not more than a half dozen may be counted, whose entire elevation is still perceptible.

With regard to the style are distinguished two great provinces, the Ionic and the Doric, which correspond geographically, the former to Asia Minor and the Archipelago, the latter to

Greece, Magna Grecia and Sicily; they touch and mingle in an Attic frontier. Let us add that the Doricism of Greece proper was not identical with that of Greece in Italy, and that the Ionicism of Europe differed from that of Asia.(158 B).

Chapter 1. Demands. -- Monumental Chronology and Topography. -- Periods.

I. The Demands.

Essentially urban and provided with abundant resources by an active practice of industry and of commerce, Grecian civilization must open an ample and splendid career to the art of building.

In truth, private demands were always mediocre. In the cities subject to a personal government, like those in which t the rule was democratic, a display of architectural luxury w would have been exposure to trouble and robbery. Neither the Grecian house nor tomb were monumental; so strongly was their role restricted, that of the former by the mildness of a climate inviting to life in the open air, that of the second by a belief in the migration of the dead into Hades, excluding the necessity of furnishing them with a substantial and comfortable funerary dwelling.

On the other hand, the demands for public buildings were i-important as well as multiplied, as much for republics as for tyrants and kings; they further at the same time were favored by the emulation prevailing between the numerous rival factions of the Grecian world, and by the faculty possessed by them for interesting the mass of the citizens; indeed, the predominance of external life made general the enjoyment of the monuments, while the smallness of the city made more evident their character of common property. And to the effect of the sovereign or of the state were normally added those of private men, who were moved by patriotism, variety, or the desire of gaining popular favor, and assumed the cost of useful or commemorative structures.

Grecian architecture was drawn in very great measure toward civic undertakings. Without speaking of fortifications, that were often very extensive -- as proved by those protecting t the group of Athens and the Piraeus; of maritime works, sometimes very important -- for example, those of Samos; of installations of sewers-- there may be cited those of Athens from the time of Pisastratos; of water supply, some of which were very remarkable -- as proved by those of Samos and Megara; it received on several occasions a mission to arrange groups; t

that of an acropolis, which was at the same time the citadel, sanctuary and crown of the city; the entirety of an agora, s such as in the Hellenistic epoch was disired by Priene, Magnesia, etc.; the entirety of a whole city -- as realized in t the 5 th century at the Piraeus, Rhodes and Thuroi, and in t the 4 th at Aleandria and Antioch.

The passion of the Hellenes for athletic sports and scanic dramas introduced a considerable demand for gymnasions and p palestras, for the physical exercises and training of athletes; of stadions for races by men, and of hippodromes for those of chariots and of horsemen; the theatres for plays and t the odeions for musical performances. The political life of the republics required platforms an places of assembly, communal houses (prytaneions), and halls for deliberations (bouleuterions); social and economic life created the need of p porticos (stoas) for walks and bazaars, whose facades combined utility and a pleasing appearance; likewise an arsenal, like that of the Piraeus, was conceived in monumental taste, and fountains and time towers had the forms of small buildings; finally from the 3 rd century, intellectual life aroused the erection of places appropriate for teaching, and for the preservation of the monuments of art and of thought, in museums and libraries.

Yet the great affair of Grecian architects was always the erection of sacred edifices. Until its decline, Hellenic civilization made a great deal of religion and was rich in various rites. Each city practised several, having as their objects the gods, frequently considered under several sides of their nature, and heroes, with particular devotion to a patron deity, whose sanctuary was a mystical centre of the country, the inner shelter of its treasury and of its archives. Thus to take an example, Athens revered:-- on the one hand, Z Zeus, Poreidon, Dionysos Eleuthereos, Asklepios, Hephaestos, Artemis Brauronia and Aphrodite Pandemos; on the other, Cecrops, the royal founder of Attica, Pandresos his daughter, Erechtheus, Theseus, illustrius among his successors; finally and especially Athena with the added names of Polias, Promachos, Lemnia, Nike, Erganeos, Hygeia etc. Besides, from all parts of the Hellenic world converged to the consecrated places, that of Olympia to Zeus, those of Delphi and Delos to A-

Apollo, the adoration and votive offerings of states, sovereigns and private men. Therefore by hundreds, the demands for temples, oratories, treasuries and monuments. Doubtless, more than one undertaking was delayed, -- ruch as that of the "Tholos" of Edidauros, that in spite of its small dimensions required a third of a century -- or even remained unfinished-- this was the case for that of the Temple of Apollo at Didyma, that never came to an end in four centuries. Yet in general, the effort was considerable, sustained and fruitful in grand realizations.

II. Monumental Chronology and Topography. The Periods.

Before the 6 th Century.

A small number of monuments may be dated from the 7 th century, and compose the elements of a preface to the monumental history of Greece. These are works of Aeolian Ionia and of Greece proper; on one hand in the Troad at Neandria, on the Tschigri-Dagh the ruins of a temple with central colonnade, and found in the island of Lesbos at Napea near Columdado, at Messa and at Mitylene, fragments of columnr, that are most important objects for the study of the origin of the Ionic o order; on the other are two edifices of the Doric style; in the Peloponnessus at Olympia being a Temple of Hera, the Heraion, at first of wood and crude bricks, whose columns were restored in stone as they decayed, and in Aetolia at Thamos, a Temple of Apollo, singular in its arrangement in two aisles and its decoration by painted terra cotta; let us add the important hydraulic works executed at Megara for the tyrant theagenes.(630-600).

6 th century.

A first great epoch of architectural production corresponds to the 6 th century; in fact it exists in continental and insular Ionia and in Magna Grecia -- then in full prosperity, even more than in Greece itself, and it manifests an equal i impetus in both Ionic and Doric art.

At the beginning of the century rose the Doric Temple of A Assos, unique for the exceptional fashion of a sculptured architrave, and two Inoic monuments remarkable for a grandeur of proportions never excelled; the first Artemesion of Ephesus, the work of Chersiphron of Cnossos and of his son Metage-

[illegible] — [illegible] at Selinus, [illegible] in the court of [illegible] was the celebrated harbor of the city and [illegible], [illegible] about 490 for [illegible], [illegible]. To this period is probably [illegible] a temple of Apollo erected at the [illegible] at [illegible], [illegible] of the [illegible], and [illegible] of the [illegible] to the [illegible] of [illegible].

In the other wing of the Greek world were erected:— at the beginning of the century on the island of Ortygia at Syracuse, a temple of Apollo (incorrectly designated as Artemis) [illegible] distinguished by the letters C and D. The second half of the century saw the construction at Paestum of the temple known by the name of Basilica, and a little later, that of Demeter; at [illegible], [illegible] temple [illegible]; at Selinus, the temple of Apollo, [illegible] G or T, in the [illegible] of the place. To these various [illegible] of the Doric formula was opposed an example of the Ionic presented in the first temple of [illegible].

[illegible] there was erected [illegible] of the [illegible] at [illegible], [illegible] at Delos, [illegible] in the [illegible] in 573, [illegible]

[illegible] and [illegible]), [illegible] organized from the [illegible] by [illegible] the [illegible] by [illegible] (about 600 [illegible]); in [illegible] the [illegible] of the [illegible], [illegible] in [illegible], in [illegible] an altar to the twelve gods, and in [illegible] a [illegible] of [illegible]

Metagenes -- burned by Erostratos in 356; a Heraon at Samos, to which as a pendant in the order of useful structures was the celebrated harbor of the city and an aqueduct, admirable for the time, executed by Eupalinor about 550 for Polycrates, an intelligent and magnificent tyrant. To this group is pro-
245 perly added a Temple of Apollo erected in the Egyptian city of Naucratis, conceded to the Greeks by Amasis at the middle of the century, and that the style of the scarce remains makes similar to the Heraion of Samos.

In the other wing of the Grecian world were erected:-- at the beginning of the century on the island of Ortygia at Syracuse, a Temple of Apollo (improperly designated as Artemis) and an Olympeion; at Metaponte, that of Apollo Lykios, called Chiesa di Sansone; the Temple of Tarente; at Selinus, the Temples distinguished by the letters C and D. The second half of the century saw the construction at Paestum of the Temple known by the name of Basilica, and a little later, that of D-Demeter; at Metaponte, the Sanctuary termed Tavola Paladini; At Selinonte, the Temple of Apollo, labeled G or T, in the n-names of the monuments of the place. To these various applications of the Doric formula was opposed an example of the Ionic presented by the first Temple of Looses.

The contribution of Greece proper, continental and insular, appeared much more modest. There was erected then by Corinth, the most ifourishing of its cities at that time, a Temple of Apollo; a Sanctuary of the same god at Delos, the religious centre of Ionia; another at Delphi, built in the second half of the century, ruined by an earthquake in 373, also two small structures in the Ionic style, a Treasury and a Hall, the first consecrated by the Cnidians (163) and the second by the Athenians; a Temple at Tiryns, of which fragments remain. Under the enlightened government of Pisastratos (561-528) and of his son 528-510), Athens was organized from the beginning of the century by Solon, and prefaced its artistic destiny by erecting on the Acropolis its first Temple of Athena, the Heka tompedon (Temple 100 ft. long),; in beginning to realize t the programme of the Olympeion, conceived in exceptional proportions, in erecting on the Agora an Altar fo the twelve gods, and in installing a fountain called Enneacronos or Callirhoe.

Chapter 2. Natural, Human and Technical Conditions. -- Influences.

A combination truly unique and propitious conditions determined the brilliant destinies of Grecian architecture.

I. Natural Conditions.

And first was the opportunity of a ready supply of stone materials of superior quality.

In the entire extent of its area, Grecian construction disposed of excellent common limestone;[1] better still, Greece p proper, the Archipelago and Asiatic Ionia were abundantly provided with marbles of different kinds.[2]

Note 1. Notably in Attica was derived from the peninsula of Akte a yellowish travertine, easily worked and carved, also resistant to the weather; in Sicily was found a porous limestone, grayish or yellowish white, and receiving well a coating of stucco.

Note 2. Attica extracted from the slopes of Pentelicos a dense and hard stone with very fine grain, whose white color after a certain time assumed a yellowish tint; from Laurium, an ordinary marble; from Hymettos a very solid material of b bluish gray color with darker veins; finally, from the quarries of Eleusis, a dark blue limestone. Southern Eubea, especially about Carystos, contained a grayish marble veined with green, quarried in great blocks, termed "cipolino" by moderns, of which the Romans made great use. Megara offered a kind, remarkable for softness and whiteness. Without mentioning t the sort that Paros supplied, and whose quality reserved it for statuary, the precious stone abounded in the islands, at Naxos, Skyros, Tenos, Andros, Thasos and also at Chios, rich in "variegated brocatello", And Asia Minor was a rival on t the one hand, due to the splendid white marbles furnished by the valley of the Caister near Ephesus, the islands of Khoresiae opposite the mouth of the Meander, the coasts of Herakleia and of Mylasa, etc., and on the other, to the polychrome marbles of Rhodes and of Phrygia, among which were particularly famed the red and white "pavonazetto".

The same for transportation; the difficulties opposed to it by the accidental conformation of the ground and the bad state of the roads were largely compensated by the location of

most Grecian cities on the coast or near the sea; this notably allowed them to supplement by importation the insufficiency of native resources in structural woods.

To nature in Greece, architecture further owed the favor of a mild and dry climate, favorable for the execution and preservation of the monuments, and also that of a marvellously p pure air, whose transparency increased the visibility of appearance, made the eyes more sensitive, taste more critical, and the perfection of the work more appreciable.

II. Human Conditions.

In contrast to the architectural styles forming the object of our studies until the present time, and whose productions almost exclusively depended upon a sovereign or a caste, that of Greece was national in a larger measure. Without falling into the exaggeration of the hypotheses, which attribute the passion and sentiment for art objects to the mass of the Hellenes in general and to the Athenians in particular,-- Hypotheses contradicted in all concerning architecture by two facts, that the iniative for all great monumental undertakings came from individuals, and that pericles was accused of squandering -- one may affirm that Grecian architects found in the peoples profoundly permeated by local patriotism, generally endowed with keen minds cultivated by travel and further rich in leisure, an attentive public, sympathisizing with their effects and possessing good judgement.

One has difficulty in imagining political and social conditions more favorable to artistic progress, than those by which Grecian architecture benefited.

Nothing could be more propitious than the harmonious alliance of variety and unity realized on the one hand by the division of Hellas into two great provinces of different temperaments, the Ionian and the Dorian, and into numerous independent states, possessing individual personalities and jealous to preserve them; on the other being the number and closeness of the relations joining these individualities in commercial and political connections, the periodical and frequent gatherings at the national solemnities, and finally the facility w with which the artists were transferred. Indeed from the multiplication of the schools and the rapid communication of lo-

local inventions resulted in very large measure that continuity and regularity of progress, which constituted one of the most striking and most characteristic traits of Hellenic architecture.

Likewise strong and equally happy was the influence of the regime of civil liberty, common to the Grecian cities. In i imposing on the art of building, instead of the economical a and elementary system observed until that time, of execution by the forced and inexperienced labor of a multitude of levied men, the very superior by onerous system of professional and salaried labor,[1] it interdicted colossal programmes and incited to a search for the effects of beauty, rather than t those of material greatness.

Note 1. Note some indications of the mode of realizing a frogramme for public architecture. A director general organizes and supervises the work, for which in a democratic country he renders account to the people, that elected him. Thus in the 4 th century, Philo, designer of the celebrated Arsenal of the Piraeus, explained to the Athenians assembled in t the theatre, how he had carried out his mission.

The stone materials were furnished by the state, which generally had them quarried by the public slaves. The execution of the main work was let by contract to builders furnishing security. Payment was made at three times; after securing t the work, the contractor received 4\5 of the price; when it was half completed, he received 1\10, and the remainder after the work was finished, provided this was not subject to deductions for bad work or delay. The director general fixed the list of prices and passed charges. Undertakings were much s subdivided, the portions being successively let. Finally, f for delicate works, dressed facings and sclupture, it appears that these were let by the piece.

The last statement is found to be strongly confirmed by the mental disposition of the race, considered as a whole. Meditative and practical, observant and thoughtful, very slightly poetical and mystical, impressed by clearness, precision and order; less inventive than ingenious and subtle; thoroughly logical, struck by analysis and dialectics, inclined to system and to sophism, prompt to codify theories and to fix rules,

the Hellenic genius must necessarily manifest itself in architecture by a disposition to advance by gradual perfections, rather than by innovations; to seek for rational methods, economical procedures, arrangements appropriate to the purpose, forms expressive of the structure and the function; to be pleased by refinements and harmonious arrangements, with a tendency to purism, to coldness and to formulas. [1]

Note 1. The sequence of our exposition will place in evidence this esthetic temperament. Henceforth we shall emphasize as one of the typical manifestations, the admirable precision that characterizes the specifications remoining to us; the least details are therein given with minute care. Furthermore, the mention made of "models"(paradeigma) seems to indicate, that they took the precaution of sketch models.

Note also as a characteristic trait, the marked taste of H Hellenic architects for theoretical speculations; it is attested by the preparation of essays relating to personal undertakings, or of general treatises.

Yet the development of these general tendencies must be different -- on the one hand directed toward effects of force and dignity, or on the other toward those of grace and richness, -- according to whether in the case the Dorian or Ionian temperament dominated. The meeting of both in Athens, the m marketplace of Hellas, predestined Attic architecture to a s style both complex and pure; in fact in its maturity, it divided its favor between the Doric and Ionic styles, even to a associate them in the same edifice, and it created the classical formulas of both, correcting the simplicity of the first by a little of the second and inversely.

III. Technical Conditions.

Note finally, that the fulfilment of the architectural vocation of Greece was facilitated by the possession of means of execution singularly perfected in comparison to those at the disposal of the schools previously examined. Besides it benefited by the mathematical speculations to which the Greeks were early and passionately devoted, it derived an advantage from the progress of metallurgy, which furnished stonecutters and sculptors with practical tools, and it had at its service hoisting machines relatively powerful, permitting a rapid and

safe handling of the materials. [1]

Note 1. The Greeks employed the pulley, crane, windlass, capstan and sling.

IV. The Influences.

Daughter of a civilization developed on the Egean basis and nourished by Chaldean science and Egyptian "wisdom", Grecian architecture profited in the most ample measure from the experience of its local and oriental predecessors. From Mycenean art it borrowed the principle of the programme of the temple and that of the Doric order, for which it perhaps also h had obligations to Egypt; to Asia Minor it was indebted for the formula of the Ionic order; finally, it drew largely from the ornamental treasury of Egypt and of Asia, Phoenician, Mesopotamian and Hittite. But all that it took, it made its own by virtue of a style, that emphasized everything from the point of suitability, harmony and proportion.

Chapter 5. Programmes for their realizations.

In a general way, Greek cities possess the primary ideal- [illegible] architectural form, [illegible] for their purposes. [illegible]

[illegible] that almost always the name of each of [illegible]

[illegible] that the programmes were [illegible] properly [illegible], that the [illegible] should create the organ.

1. Civic, Military and Secular Programmes.

The City.

Every typical Greek city was a labyrinth of narrow and crooked alleys, with some open spaces for use as markets and places of assembly, badly defined and encumbered by chapels, fountains and statues. For new cities, the 5th century inaugurated and those following developed even to excess the fashion of systematic and regular plans, broad and straight streets, sometimes bordered by colonnades, and quickly limited squares, partially or entirely enclosed by porticoes.

In every [illegible] the Greeks loved to impress an architectural consequence on the public features. As revealed by vase paintings and [illegible], their shape sometimes formed a niche, sometimes a porch against a wall, or sometimes a kiosk with columns; [illegible] even on a monumental arrangement [illegible]

[illegible]

[illegible] relatively rare; it was the [illegible] everything [illegible] with [illegible]

[illegible]

[illegible] (123).

The [illegible].

[illegible] realization complete, the programme of the [illegible] -- [illegible]

Chapter 3. Programmes and their Realizations.

In a general way, Grecian edifices possess the primary quality of an architectural work, fitness for their purpose. Their form and arrangement are orderly, simple, clear and practical. Also the fact, that almost always the name of each of their elements is equivalent to a definition of its role, indicates that the programmes were thought out by men properly convinced, that the function should create the organ.

I. Civic, Miliatry and Secular Programmes.

The City.

Every ancient Grecian city was a labyrinth of narrow and c crooked alleys, with some open spaces for use as markets and places of assembly, badly defined and encumbered by chapels, fountains and booths. For new cities, the 5 th century inaugurated and those following developed even to excess the fashion of systematic and regular plans, broad and straight streets, sometimes bordered by colonnades, and clearly limited s squares, partially or entirely enclosed by porticos.

In every epoch the Greeks loved to impress an architectural appearance on the public fountains. As revealed by vase paintings and by ruins, their shape sometimes formed a niche, s sometimes a porch against a wall, or sometimes a kiosk with columns; this might even be a monumental arrangement for a w water basin, like that at Olympia, whose cost was paid by Herodes Atticus.

Grecian fortification was relatively wise; it was not restricted to erecting solid ramparts furnished with battlements and slots, with walks along their tops -- sometimes covered -- or as balconies along their inner sides; to multiplying enclosures and excavating ditches; it further practised zigzag or sawtooth outlines, the flanking of walls by towers generally square, but sometimes polygonal or circular, and the defense of gates by the projection of the bastions or by a deceitful arrangement. (168).

The House.

Without realizing comfort, the programme of the Grecian house -- such as revealed to us at the end of its development by the ruins of Priene, Delos and Thera -- is appropriate to the climate and the customs; for it ensures both that enjoym-

enjoyment of the open air, the shade and coolness, which the serenity, heat and luminosity of the Mediterranean sky caused to be desired, and that intimacy of domestic life, that half
162 seclusion of the women suited to a civilization approaching in a certain measure those of the East.(169).

The key of every arrangement was a court around which were found the different rooms, generally separated from it by a portico, from which they derived a weakened light, and which in itself formed a shady and ventilated apartment; the rooms were high--they generally reached 16.4 or 19.7 ft. at Delos; the roof was chiefly a terrace suited for nightly repose during the hot season; the ground was paved or covered by mosaic. Subterranean cisterns collected the rain water.

Every precaution was taken to isolate the dwelling from the outside and to establish in the interior a distanct separation between the portion devoted to social life (andronitis) a and that reserved for private life (gynaikonitis). Ordinarily the facade had no opening other than the doorway; if pierced by openings, these were small and placed high. The entrance was generally modest and narrow, but sometimes furnished with a small porch (prothyron). It gave access to a corridor on which opened the porter's lodge, and which among the wealthy was enlarged to form a vestibule (thyroreion). The principal room of the house -- termed "oikos"-- where was kept t the domestic hearth, and which served for a dining and sitting room, was situated north of the court, so as to benefit by the sun in winter. This was an apartment of sometimes considerable dimensions, that received light either through the doorway alone or by two windows pierced at its sides, or by a triple entrance. It was sometimes preceded by an open vestibule, enclosed by two extended walls and columns (prostas, p prodromos). On the contrary, the sleeping room (thalamos) w was small and dark. A small garden completed certain arrangements. Commonly the elevation comprised at least a second story, accessible by stairs in wood or stone.

The great defect of the Grecian dwelling was in vicinity of the same court, of the apartments of the master, kitchens, o outbuildings and lodgings of slaves.

Public Edifices.

264 Public Edifices.

Prytaneion, Bouleuterion. Lesche. Portico. Gymnasion. Theatre. Odeion. Stadion. Hippodrome.

A Prytaneion was the communal inn where dwelt the group of prytanes, charged with maintaining the hearth of the city and with entertaining the guests of the state, differing from the
265 house of a rich man only by the increased dimensions and by an enlargement of the "oikos". (170, 1).

As for the Bouleuterion, intended for assemblies of the magistrates, it substantially comprises a hall, where steps rise on a rectangular or semicircular plan. (170, 2, 4).

The Lesche of the Cnidians at Delphi gives us an idea of t the places of reunion designated by that name, a sort of club in which the Greeks loved to meet each other; it was a rectangular room, whose ceiling was supported by a series of eight columns.

The Stoa (covered portico) rendered the same service to loungers and to traders, and resulted from setting a row of isolated supports either in front of a rear wall -- in which c case it was not rare that the former was doubled or even tripled -- or on each side of a middle wall; the gallery was sometimes in two stories, like those erected by Attalos II at Athens and by Eumenes II at Pergamos.(167). The dimensions might be considerable; the Stoa of Attalos at Athens measured 368 ft. long and 64 ft. deep, that of Eumenes having the cor-
266 responding dimensions of 535 and 52.5 ft. When the purpose of a portico was commercial -- it then bore the significant name of show room (deigma), -- it comprised an alley portion for exhibit and sale and a storeroom part; either arranged on the same level and bordering the first, as at Magnesia on Meander (171, 1), or in a basement, as at Egae, Alinda (171, 2 3) and Pergamus.

The plan of a Grecian Gymnasion (palaistra, gymnasion) was adapted to its twofold purpose of a place for physical exercises and a centre of intellectual life; on the one hand, an arena open to the sky, vast covered areas for the case of bad weather, porticos for walking or for rest, chambers, halls f for ablutions and baths; on the other, small and large rooms arranged for conferences or academic sittings.(172).

The arrangement of the Grecian Theatre did honor to its inventors, for it was an elegant solution of a quite difficult problem. On the one hand, the representations given there w were composite, associating parties of the chorus, of dancers, and of the dramatic action; on the other, the number of spectators was considerable, always several thousands, sometimes exceeding twenty thousand as at Athens, Miletus, Megalopolis and Syracuse. The Grecian architect understood how to favor the development of the play and to ensure the convenience of the public, by arranging at the centre of a stepped semicircle termed theatron or koilon (hollow place), a circular area called Orchestra or conistra, behind this and tangent to its circle and parallel to the chord of the limiting arc of the entire plan being a platforl, the stage (scene).(173; 175; 177).

To realize the semicircle, the practical genius of the Greeks always endeavored to economically utilize an accident of the site; sometimes using a valley and sometimes the slope of a hill or rocky eminence, completing the natural formation by means of excavation or filling. Besides, whether excavated in the rock or built, the seats were formed by simple steps; only those situated in the first row became places of honor (thrones),and were both distinguished and made more comfortable by the addition of backs and arms. Note that the lack of a covering left the public and the actors exposed to sun and rain.

Limited at each side by a transverse supporting wall and at the top by a wall or a circular portico, the semicircle was divided into sectors (kerkides) by stairways radiating from the orchestra and upwards in two or more zones separated by a wide step (diazoma).(173, D).

This subdivision was well adapted to favor passage, but was not the only mark of the firesight of Grecian architects. T There was another in the adoption for the contour of certain theatres -- for example,that of Epidauros -- of a composite horseshoe outline, by which the visibility of the drama was increased. Such was again the precaution of opening between the ends of the semicircle and stage, of a wide passage through which the crowd of spectators could easily pass; also th that of multiplying the stairs in the upper zone on account

of the increased length of the steps, and also as the case at 268 Epidauros to change the profile of the part above the diazoma (of the upper zone), so as to lessen somewhat the distance to the last rows.(174). Praiseworthy is also the ingenious idea of recessing the face of each step to allow bending the legs, and of sinking its upper surface to furnish a resting place for the feet of persons on the next row above.(174).It is necessary to mention the care taken to ensure removal of rain water by means of a channel cut at the base of the semicircle.

The orchestra, at the centre of which rose an altar consecrated to Dionysos, and which was the centre of the acts of t the chorus, had no fixed dimensions; the ratio of its diameter to that of the semicircle was one third at the Theatre of Epidauros, one fifth at the Theatre of Athens. Its area was composed of a layer of tamped earth -- this is the case at Epidauros -- which perhaps was covered by a floor, sometimes by a mosaic pavement, as at the Theatre of Delos, or sometimes by slabs of marble, as at Athens.

The stage was substantially composed of a platform raised 4.9 to 11.5 ft. above the ground of the orchestra, and accessible by stairs or ramps. The space beneath it, termed "under the stage" (hyposcenion), was utilized as a storeroom for the materials and as a room for the actors, being closed on the side next the orchestra by a wall pierced by doorways, and t that bore the name of"proscenion"(before the stage).[1] The front portion of the platform for a width of 4.9 to 8.2 ft. fo- 269 rmed the tribune expressly named "logeion" (speaking place), where the actors declaimed while the rear portion served for behind the scenes.[2] The platform, after the reduction of the chorus had determined a devlopment of the stage at the expense of the orchestra, was closed at the rear by a wall surmounted by a sounding board and shaped like the facade of a p palace, as may be seen at the Theatre of Aspendos, and along the ends by a sort of projections for use as side scenes, termed "Parascenia".(176; 177).

Note 1. According to a theory by M. Dörpfeld, in the Hellenic period the place of the actors was in the orchestra, the stage being no more than a tent or shed serving as rooms or storerooms.

Note 2.

Note 2. If we select as the best preserved example and the most successful of Grecian theatres, according to Pausanias, that of Epidauros, the following statements are given:-- the auditorium (koilon) comprises 55 steps, the last of which was 74 ft. above the floor of the orchestra and nearly 194 ft. f from its centre, being at the middle of the curve nearly 230 ft. from the stage! Behind the 34 th step and at the height of 37.8 ft. extended a passage 6.2 ft. wide. The orchestra, properly so-called, of tamped earth and defined by a stone border 1.25 ft. wide, and separated from the internal curve of the auditorium by a channel measuring 6.9 ft. between curbs, has a diameter of 64.0 ft. Finally the platform is 72.5 ft. long between the side scenes and is 11.6 ft. above the orchestra. The acoustics are excellent.

The plan of a theatre frequently comprised porticos on the exterior, very much appreciated in case of showers.

The essentials of the arrangement of the Grecian theatre w were found again in the disposition of three edifices of analagous purposes:-- the Odeion, which was set apart for musical performances, the Stadion and the Hippodrome, of which the f first served for the spectacle of the games, the second for chariot races.

The odeion only differed from a theatre in being smaller a and covered.

The Stadion was composed of a straight track -- the length of a measure unit of 500 ft.,-- 30 ft. wide, and of an auditorium rising in steps around it, sometimes crowned by a promenade beneath a portico,-- as it was at Messene, Prieue aod Aphrodisias. Sometimes -- for example at Olympia and at Epi-Epidauros -- the plan was rectangular, and there were seats only along the two longer sides; one of the ends was sometimmes rounded and rows of seats extended around it; it was thus at Athens and Delphi; or indeed as at Aphrodisias and at Laodicea, both ends were alike, in which case the edifice received the name of amphitheatre.

As for the Hippodrome, it was nothing more than a great stadion with arrangements on the track for starting and turning of the chariots. [1]

Note 1. Compare the Roman Circus.(Book III, Part 2, p.4616

II. Religious Programmes.

The Temple.

According to the ordinary conception of the ancient East, the Grecian temple was properly the dwelling or lodging of a deity, where it was actually present under the form of a statue and received homage and offerings. Yet was distinguished from the divine mansions heretofore visited by us by a simplicity of plan and moderate proportions,[2] which are explained, both by the small development of worship, by its restricted character, and by the obstacles presented to the conception of vast programmes by the economic and social conditions of the architectural productions and the esthetic tendencies of the race.(Page 259).

Note 2. See Chapter 5, page 316 for the dimensions.

Just as the Grecian deity was represented in the image of man, so his dwelling was imitated from the portion intended for receptions an a Grecian house. As appropriate was taken a model from the best in that kind, the megaron of the Mycenean palace, in relation to which the affiliation of the Hellenic temple appeared evident and direct; indeed in the freed cities, the sovereignty of the gods had replaced that of the kings.

The essentials of a temple were reduced to a hall (naos, sekos, adyton, cella), at the rear of which was found the divine image, sometimes in an area enclosed by a balustrade, traces of which are still observed in the Temples of Zeus at Olympia and of Athena Polias at Priene.

For furniture were an altar, tables, ritual instruments and articles of value, propriatory or votive offerings. Crypts w were exceptional.[1]

Note 1. As examples may be cited those excavated , at Athens beneath the Sanctuary of Poseidon in the Erechtheion; at Epidauros under the "Tholos"; at Aizani under the Temple of Zeus.

The naos formed a parallelogram, generally elongated. Almost always was it orientated from East to West, the entrance being at the East. It was a rule, that it was placed on a stylobate (crepis), i.e. on a concentric and more or less elongated base of rectangular plan, whose footings projected b

object the sap, [illegible] usually in [illegible] [illegible]; [illegible] by the seeds of the [illegible]

[illegible]

of the western end.(174).

The same thoroughly primitive, temples examples of which may be cited in a temple of Demeter at Megara near Selinunte (175, 1), and in the most ancient Sanctuary of Apollo on Mt. Cynthus at Delos, was the object of various developments in plan and elevation.

The first and almost always, in conformity to the require-ment of a [illegible] (fig. [illegible]), access to the sanctuary was rendered by the addition of a vestibule, termed pronaos or prodomos. The arrangement of this varied. Generally it consisted of a prolongation of the side walls of the naos, sometimes these were continued to a great length to enclose a closed cell, accessible by a doorway, as may be seen in seve-ral temples of Selinunte(175, 2). Most frequently in this [illegible] in front and enclosed on this side by the columns supporting its roof and by pillars: the Temple of Themis at Rhamnus pre-sents an example of it. This type of pronaos was susceptible of development in depth, an idea of which is given by the ar-rangement of 'temple C' on [illegible] (175, 4), that of [illegible] (fig. 1), and the Temple of Apollo at Delos.(175, 5). Often -- in which case the temple was termed prostyle -- the lateral walls of the pronaos were shortened more or less, the pro-naos [illegible] being replaced by one or several isolated col-umns; that is observed in a small "temple of Empedocles" at Selinunte.(175, 4). It is even not rare that the prostyle [illegible] entirely [illegible] and the porch became a portico; it is thus in the temple of Athena Nike at Athens,(173, 5; 181) and at the sanctuary of [illegible] at Rhamnus(175, 4; 1[illegible]).

[illegible]

preceded by a sort of exterior portico with columns. Finally, to complete that the vestibule was balanced by a sort of [illegible]; thus in the Temple of [illegible] the pronaos was separa-ted from the naos -- [illegible] under the open sky -- by a [illegible] wall for the use of the [illegible], too [illegible] to [illegible]

beyond its top, with its faces profiled usually in steps and rarely vertical; ascent was made either by the steps of the stylobate themselves, or when these were too high, by a stairway of by a ramp, the mode in the Peloponessus, both arranged at the eastern end.(214).

Yet this elementary programme, realized examples of which may be cited in a Temple of Demeter at Gaggera near Selinonte (178, 1), and in the most ancient Sanctuary of Apollo on Mt. Cynthos at Delos, was the object of various developments in plan and elevation.

And first and almost always, in conformity to the requirements of a well understood display, access to the sanctuary w was retarded by the addition of a vestibule, termed pronaos or prododos. The arrangement of this varied. Generally it resulted from a prolongation of the side walls of the naos. Sometimes these were returned at a right angle to enclose a closed hall, accessible by a doorway, as may be seen in several temples of Selinonte.(178, 2).[1] Most frequently in this case the edifice is termed in-antis -- the vestibule was open in front and enclosed on this side by the columns supporting its roof and by grilles; the Temple of Themis at Rhamnus presents an example of it. This type of pronaos was susceptible of development in depth, an idea of which is given by the Artemesion of Magnesia on Meander (178, 3), that of Ephesus (2 (215, 1), and the Temple of Apollo at Didyma.(178, 6). Often -- in which case the temple was termed prostyle -- the lateral walls of the pronaos were shortened more or less, the parts suppressed being replaced by one or several isolated supports; that is observed on a small "Temple of Empedocles" at Selinonte.(178, 4). It is even not rare that the projections were entirely omitted and the porch became a portico; it is thus at the Temple of Athena Nike at Athens,(178, 5; 164) and at the Sanctuary of Athena at the Erechtheion.(179, 4; 165). Again sometimes the vestibule was double, the pronaos being preceded by a sort of external portico with columns,[2] Finally, it occurred that the vestibule was doubled by a sort of intechamber; thus at the Temple of Didyma the pronaos was separated from the naos -- otherwise under the open sky -- by a waiting hall for the use of the devotees, who came to consult

oracle of Apollo.(178, 6).

Note 1. See Temples C and S.

Note 2. For example the Great Temple of Selinonte (178, 7); at Athens, the Temple of Dionysos Eleuthereus and the Sanctuary of Poseidon at the Erechtheion, and at Samothrace, that of the Cabyres.(178, 8).

Some temples had their cells divided into several halls; t this complication [2] was doubtless required in certain edifices by the coexistence of two sorts of worship of the same deity regarded under different aspects; in others by the fact of the residence of two deities under the same roof.

Note 2. It appears to have been the fashion at Selinonte, where it was shown by no less than four examples. See Temples C, D, R and S.

The arrangement was usually realized by means of a transverse wall. Access to the rear sanctuary was sometimes through a doorway in the partition (179, 2), sometimes by a special entrance either opened in the rear facade of the edifice -- as at the first and second Parthenon of Athens (179, 1, 3) a and at the Temple of Mantinea, which Ares divided with Aphrodite, -- or in the side, as at the Temple at Phigalia (180, 6) and at the Erechtheion of Athens. (179, 4). The superposition of the two sanctuaries was exceptional; it characterized a Temple of Sparta, in which was worshiped on the ground floor Aphrodite Promachos, and Aphrodite Morpho on the upper floor.

215 In certain temples -- not numerous and several are of small dimensions, -- the cell was diwided into two or three aisles by one or two rows of columns aligned with its axis. The division into two aisles by a middle colonnade, examples of which are offered by the Temple of Neandria (180, 2), the primitive Temple of Locres, that of Thermos, the "Basilica" of Paestum, appears to be the most ancient and was abandoned early. That in three aisles, the middle one wider, and sometimes -- the Parthenon presenting an example -- closed at the rear by a transverse colonnade, which isolates a sort of ambulatory (180, 4), is complicated by a division of the side aisles into two stories by a floor placed at about mid-height (181; 200). The purpose of this upper story is uncertain; a

although it singularly aided in the solution of the problem
of the roofing, the series of isolated supports plays no str-
uctural part, since this is found in edifices as narrow as t
the temples of Egina, and it is wanting in others of twice
the width; on the other hand, the access to the galleries by
stairways like those of which traces are found in the Temples
of Zeus at Olympia, of Poseidon at Paestum, of the Temple of
Concord, of "Hera Lacinia" and of Asklepios at Agrigente, was
too inconvenient for retaining the hypothesis of public trib-
unes. Doubtless these upper parts are to be regarded as sto-
rerooms or treasuries.

An exceptional arrangement, applications of which are offer-
ed by the Heraon of Olympia and by the Temple of Phigalia (180,
5, 6), connects the columns to the side walls of the cell, t
thus determining an equivalent of the side chapels of mediae-
val churches.

The cell was generally covered, as proper beneath a sky th-
at sheds rain. Indeed the exceptions were sufficiently nume-
rous, that the classification made in antiquity for the vari-
ous sorts of temples reserved for them one of its classes, t
termed hypethral, otherwise under the open sky. Since these
are presented to us, not only by very wide aisles as at the
Temple of Apollo at Didyma and at the Olympeion in Athens, b
but also by those relatively narrow, like that of the Temple
of Phigalia (180, 6), one cannot explain them by inability in
construction. In any case, they had as a consequence the ar-
rangement of a shelter for the statue of the deity; at Didyma,
this was a tabernacle; at Phigalia, a large chapel.

Like the living room of the Grecian house, through the door-
way the cell of a temple received light and air for the most
part, the lighting thereby received amply sufficing; besides
that shadow was better suited to a sanctuary than full light-
ing, the dimensions of the opening were such, especially in
height, that the ratio of area of its opening to that of the
surface to be lighted, under the clear sky of the eastern Med-
iterranean, was superior to that appearing rigorously accept-
able for a living room under the foggy sky of northern Europe.[1]
It is also probable, that except on solemn occasions, they w
were contented with the lighting supplied by a transom arran-

arranged over the closed door.

Note 1. Thus at the Parthenon the opening of the doorway was to the area of the middle aisle as 1 to 5, when in north-east Europe, people are accustomed to windows, whose ratio to the extent of the room is 1 to 10.

That a Grecian temple might realize the finished type of t the species, it was necessary that in addition to all the elements previously mentioned, its programme should comprise an opisthodome (treasury) and a peripteral portico (also called pteroma), otherwise meaning a repetition of the pronaos at t the rear end and a continuous portico on columns.

The opisthodome does not usually communicate with the cell, so it may be doubted that it had a useful purpose; yet, closed by grilles, it could render the same service as the internal galleries of the cell, i.e., shelter a surplus of furniture.

The peristyle, the principle of which is sought in the series of open galleries enclosing the court of honor developed before the Mycenean megaron (128, 2), constituted both a shady promenade for the use of the faithful, a shelter for objects vowed to the deity, and a precious element of esthetic e effect. According to epochs and places, its role was more or less important; in the 6 th century, it far excelled the sanctuary, since it alone occupied three fourths of the total area of the platform (182, 2); the classical period conceded to it scarcely half that extent (182, 1); finally the Hellenistic age favored it anew. It was developed sometimes by spacing the columns farther from the walls (182, 3), sometimes by doubling the row, as at the Temple of Apollo at Selinonte, on the facade alone, or as the Olympeion of Athens and the Temple of Didyma, on all sides (182, 4).[1]

Note 1. The antique architectural terminology applies the term peripteral to every temple provided with a peristyle, d dipteral to those with a doubled portico, and finally to those where the portico was made wider, that of pseudodipteral.

The peristyle was at this point an integral part of a normal temple programme, that if by chance, as the case for the unfinished Temple of Zeus at Agrigente, an excessive enlargement of the scale prevented the realization, at least was suggested the idea by the artifice of a colonnade engaged to the walls of the cell(182, 5).

To the rule of the rectangular plan was rarely opposed the religious architecture of Greece, and it appears not before the 4 th century was the exception in circular form; again t this was only done for edifices of small proportions. The a arrangement of a tholos -- such was the name of the round sanctuary -- borrowed its elements from the normal type and comprised three variants, distinguished by the terms apteral, peripteral and monopteral. The first, an example of which is presented by the Arsinoeion of Samothrace, is reduced to a b blind rotunda (183, 1). The second surrounds such a small s structure by a peristyle; we see it realized in the Marmaria of Delphi by the Tholos of Athena Pronaia; at Epidauros by t the Tholos of Polycletes (183, 4); at Olympia by the Philippeion (183, 3). The third only admits of a colonnade, producing a sort of lantern; the Temple of Rome and Augustus on the Athenian Acropolis consisted of a structure of that kind (183,4); The Tholos of Epidauros shows us an integral transfer of the formula for a temple on a square plan, for its interior was divided by a circular colonnade into a central area and an ambulatory.

The Treasury. -- The Telesterion. -- The Altar.

Besides the programme of the temple, Greece also proposed to religious architecture those of the treasury, the telesterion and the altar.

The plan of the treasuries, which were near the Temple of Zeus at Olympia, and at Delphi and Delos near the Sanctuaries consecrated to Apollo, did not differ from that of the temple in the first stage of its development; like that it comprised a rectangular cell and a vestibule open in front. Indeed it is necessary to see in them also storerooms annexed to the s sanctuaries near them, special chapels in which was manifested the devotion of a city by the exhibition of offerings.(163).

Because of its purpose as a place of assembly for those initiated in the mysteries, a telesterion or mystic cell could not accommodate itself to the arrangement of the temple; that of Eleusis indeed retained from the latter its rectangular a arrangement and the portico facade, but its dimensions were greater (165 × 158 ft.); access to it was facilitated by opening six doorways, two in the front and in each side; finally,

in the interior was presented a great hall bordered on each side by eight rows of steps, whose ceiling was supported by a series of 42 columns, on which rested a similar hall, termed megaron, devoted to the higher initiation.(170, 3).

The altar (bomos) on which was burned the flesh of the victims, was outside the temple, placed on the ground before the facade and on the axis of the cell; the Temple of Poseidon at Paestum offers an example of it. Sometimes it was a true monument, formed of a stepped structure above a substructure, on whose platform was performed the sacrifice and the burning of the animals; such were the great altars of Olympia, Syracuse, of Parion in the Propontis, and particularly that of Pergamus. the proportions were often considerable.[1]

Note 1. At Syracuse the base covered a rectangle 605 ft. long and 67 ft. wide; at Parion it measured a stadion (565 ft) on each side; at Pergamus a square terrace supported at 16.2 ft. above the ground an area of about 9000 sq. ft., access to which was by a broad stairway; at the middle rose the mass of the altar proper, much above the porticos surrounding it on three sides.

Frequently the ground around a sanctuary was consecrated to the deity under the name of temenos. In this case it was defined by an enclosure termed peribolos, whose inner faces were bordered by porticos, as proved by the precinct of Athena Polias at Priene, that of Aphrodite at Aphrodisias, that of Zeus at Aizani etc. Generally the gateway was monumental, f formed by a propyleion in Mycenean style (page 195); as typical examples may be cited those of the precincts of the holy places of Egina, Cape Sunion, Delos, Eleusis, Epidauros, Olympia and Priene, and particularly that affording access to t the Acropolis of Athens. The plan for a propyleion was substantially composed of two porticos placed against each other, separated by a transverse wall, in which were pierced one, t three or five openings. These vestibules were frequently unequal, that most developed being divided into three aisles by two rows of columns. At the Propyleion of Athens, the model of the kind, the gateway proper was flanked on each facade by two wings with porticos, those of the exterior projecting and the others recessed. Unfinished as it is, the edifice covers

more than 6870 sq. ft., two thirds of which are for the pass-age; completed, it would have occupied an area more than con-sidered (Dm, 3; 168; 226). More modest, the Propylaea of San-ion measured only 1330 sq. ft. in area, and those of Priene but 538 sq. ft. (Dm, 1, 3). As for the openings, they had m moderate dimensions; for the Propylaea of Athens, the princi-pal one was 13.75 ft. wide with a height of 24.2 ft.; at Su-nium, the opening was equivalent to a little more than one half of the preceding; at Priene, it did not equal one fourth.

III. Funerary Buildings.

There is scarcely any sort of tomb, that Grecian architect-ure has not realized.

[illegible]
were freely excavated, frequently announced by a facade in the shape of that of a temple or a house, sculptured in the rock or constructed; examples abound in Paphlagonia and Lycia in Asia Minor; they are numerous in Cyrene, and Syracuse presents typical examples.

The tomb crowned by a tumulus was rare in Greece proper, but it was common in Macedonia, where the region of Pydna has re-vealed a very remarkable one of the Hellenistic period.[1] The type of the funerary mound is again found in Asia Minor. The tombs of the royal house of Commagene near Samosata, its capi-tal, prove that it was in favor in southern Syria in the 1st century B. C.[2]

Note 1. Composed of a descending vaulted passage, of two vestibules of small depth, and of a chamber measuring 13.1 x 9.8 ft.

Note 2. These are indeed cones of small stones, 32.8 to 1
[illegible]
of which are flanked by two rows of colossal statues command-ing high terraces, the others by three groups arranged at eq-ual intervals, of two or three columns surmounted by statues; the whole had a grand appearance.

Tombs beneath the open sky fall into three great categories. In Greece proper and notably at Athens, they were satisfied
[illegible]
or a pillar, marked by an inscription or crowned by an urn; a

more than 6670 sq. ft., two thirds of which are for the passage; completed, it would have occupied an area more than doubled (184, 2; 162; 218). More modest, the Propyleion of Sunion measured only 1290 sq. ft. in area, and those of Priene but 978 sq. ft.(184, 1, 3). As for the openings, they had m moderate dimensions; for the Propyleion of Athens, the principal one was 13.75 ft. wide with a height of 24.2 ft.; at Cape Sunion, the opening was equivalent to a little more than half that of the preceding; at Priene, it did not equal one third.

281 III. Funerary Programmes.

There is scarcely any sort of tomb, that Grecian architecture har not realized.

When the ground lent itself thereto, rock-cut sepulchres w were freely excavated, frequently announced by a facade in t the image of that of a temple or a house, sculptured in the rock or constructed; examples abound in Phrygia and Lycia in Asia Minor; they are numerous at Cyrene, and Syracuse presents typical examples.

The tomb beneath a tumulus was rare in Greece proper, but it was common in Macedonia, where the region of Pydna has revealed a very remarkable one of the Hellenistic peeiod.[1] The type of the funerary mound is again found in Asia Minor. The tombs of the royal house of Commagene near Samosata, its capital, prove that it was in favor in southern Syria in the first century B. C.[2]

Note 1. Composed of a descending vaulted passage, of two vestibules of small depth, and of a chamber measuring 13.1 x 9.8 ft.

Note 2. These are indeed cones of small stones, 32.8 to 4 49.2 ft. high and 115 to 490 ft. diameter, the most important of which are flanked by two rows of colossal statues dominating high terraces, the others by three groups arranged at equal intervals, of two or three columns surmounted by statues; the whole had a grand appearance.

Tombs beneath the open sky fall into three great categories. In Greece proper and notably at Athens, they were satisfied by indicating the place of burial by the erection of a column or a pillar, marked by an inscription or crowned by an urn; a

bust, or rather a stele, i.e. a slab set on a base; this was generally narrow and ended in an acroteria, often with an added figure in low relief; it was sometimes fashioned in the image of a facade with antes, sometimes enclosing a panel, a and sometimes an actual niche animated by the more or less p projecting sculpture of the figure of the deceased or of a funereal scene.(185).

In Lycia, the fashion was for small buildings faithfully r reproducing the appearance of the native house. The Heroon of Gjölbaschi-Trysa shows that the programme could further c comprise a reduction of the court surrounding the dwelling, with its enclosing wall; it is a species of square with 5160 sq. ft. area enclosed by a wall 19.7 ft. high and accessible by a great portal.(141).

Finally, tombs like that of Theron, so-called, at Agrigente, that of Agathemeros at Termessos in Pisidia (167), the "Tomb of the Lion" at Cnidos, the "Monument of the Nereids" at Xanthos in Lycia, and particularly the Mausoleum of Halicarnassos (186) realize a properly ornamental formula, which proceeds directly from that of the temple; a chapel surmounting a high basement, itself set on a solid with steps. At Agrigente, T Termessos and Cnidos, the proportions were relatively modest, and the appearance was that of a simple cell. On the contrary, the Tomb of Xanthos and especially that of Halacarnassos form actual edifices, with crypt in the base, above being an actual sanctuary surrounded by a peristyle[1] In brief, a tomb like the "Monument of the Nereids" is not to be distinguished from a relegious structure; on the contrary, the Mausoleum a and the "Tomb of the Lion" emphasize their purpose by a crowning in pyramidal form, surmounted by statuary, in one case being a representation of a prince and his wife on a guadriga, and in the other one of a crouching lion.

Note 1. The "Monument of the Nereids" measures in plan 32.8 × 20.6 ft. The Mausoleum occupied more than 11,840 sq. ft. and extended to about 134.4 ft. above the ground; the colonnade has nine columns on the facade and eleven on the side.

285 IV. Commemmorative Monuments.

For a monument commemmorating an event or a vow, the form preferred by the Greeks appears to have always been that of a column, sometimes quite tall, on the top of which was placed a statue, or the object which it was desired to consecrate.

Without mentioning the representations offered by the vase p paintings, numerous examples have been furnished by the Athens of the 6 th century and the precinct of Apollo at Delphi; the most notable are the columns recently revealed by the exploration of the latter place, and which support in one case a winged sphynx, in the other a tripod and a group of dancing women (189). Yet certain choragic monuments of Athens, -- s such as those of Lysicrates (190,; 219, 12) and of thrasyllos, -- show that an equal favorite was a type of small structure in the form of a lantern or kiosk.

Chapter 4. The Construction.

In the domain of construction, as in all others, Grecian a[illegible] did not show itself in invention, and its contr[illegible] to the general treatment of the art was reduced to a [illegible] development of constructions and to the perfecting of syst[illegible], each of which was a heritage from the preceding Egyptian [illegible]vilisations, and that Egypt had invented some two thousand [illegible]

[illegible] not like that devoted to the colossal; besides for reaso[illegible] obviously caused [illegible] restricted to moderation [illegible] subjected to reason, it always gave proof of conservatio[illegible], of [illegible], at least in monumental construction; often of refinement; sometimes of minute care. [illegible], it [illegible] how to make the [illegible], was merely [illegible] of [illegible], especially when it was simple; [illegible] for logical [illegible] confident in its calculations to assume great risks.

It was not before the middle of the 5 th century, that Gre-[illegible] Grecian construction the epoch of [illegible] and of [illegible], at the end of [illegible], of a regular [illegible], that had passed through four great phases.

In the course of the first, which was prolonged till the 6 [illegible] century, and whose memory is preserved by monuments like the Heraion at Olympia and the temple of Apollo at Thermos [illegible] the [illegible], it remained in the art of the traditions of the Mycenaean age. It continued to erect a wall in crude [illegible], to consolidate it by wooden [illegible], to protect its surface by a [illegible], or by a [illegible] of coats, to limit [illegible] the elements of a portico, employing stone co-[illegible]

[illegible] with level and equal courses.

The 6 th century introduced construction entirely in stone, and [illegible] for the problems set by it, solutions [illegible], the [illegible] of which were already very satisfactory.

Thus at about the middle of the 5 th century, Grecian cons-[illegible] was in possession of all the essentials of its syst-[illegible] and [illegible] procedures.

286. ## Chapter 4. The Construction.

In the domain of construction, as in all others, Grecian a architecture did not show itself an innovator, and its contribution to the general programme of the art was reduced to t the development of conceptions and to the perfecting of systems, part of which was a heritage from the preceding Egean c civilizations, and that Egypt had invented some two thousand years earlier.

Much better equipped with tools than its venerable ancestor, and not like that devoted to the colossal; besides for reasons previously stated (pages 258-259) restricted to moderation and subjected to reason, it always made proof of conscientiousness, of method, and of knowledge, at least in monumental construction; often of refinement; sometimes of minute care. In its maturity, it endeavored and understood how to make the organs appropriate to the functions, was wisely economical of material, especially when it was marble; careful for logical construction and perfect execution; after all sufficiently c confident in its calculations to assume great risks.

It was not before the middle of the 5 th century, that closed for Grecian construction the epoch of tentatives and of frogress, at the end of a time, of a regular belief, that had passed through four great phases.

Tn the course of the first, which was prolonged till the 6 th century, and whose memory is preserved by monuments like the Heraion at Olympia and the Temple of Apollo at Thermos p preserve the memory, it remained in the net of the traditions of the Mycenean age. It continued to erect a wall in crude bricks, to consolidate it by wooden anchors, to protect its surface by a coating or by a wainscoting of boards, to fashion in wood all the elements of a portico, employing stone only for substructures, elsewhere in regular blocks, carefully joined with level and equal courses.

The 6 th century introduced construction entirely in stone, and found for the problems set by it, solutions more and more appropriate, the last of which were already very satisfactory.

Thus at about the middle of the 5 th century, Grecian construction was in possession of all the essentials of its systems and of its definite procedures.

from the [illegible] tendency to exag-
gerate science, which may be partly explained, both by the en-
largement of the programme, and by a diminution of material
resources.

Note that according as the critics employed the logic of t[illegible]

[illegible]

1. The Materials.

When the classic construction was exclusively in stone, at least when it was in the service of monumental architecture. While bricks always remained in favor for the walls of cities because their resistance to blows of the battering ram was greater than that of stone.[1]

Note 1. In the 4th century, the [illegible] of which were built [illegible] of Athens, resist [illegible] one foot on each side. A [illegible] of them was constructed by inserting a wooden grill-[illegible] in the [illegible].

There was no objection to the association of different materials in the same edifice. Thus the sides of certain archaic monuments of that primitive epoch -- for example those of [illegible]

the 6th century [illegible], architraves were placed on stone columns. In the same epoch were freely introduced in a stone edifice parts in terra cotta: tiles, [illegible], plaques and [illegible]. In the decline of the 6th century and in the first half of the 5th, [illegible] -- there are [illegible] of the [illegible] of [illegible] on the [illegible] and of the Temple of Hera at Olympia -- contemplated the [illegible] of the [illegible], those still light, of an edifice in dimensions. Finally, for the roof was [illegible] a great deal of wood.

Grecian carpentry does not appear to have surpassed the primitive phase, in which [illegible] was attained by placing timbers on each other. It was ignorant of the lofty system of the truss, which transforms the transverse into tension. [illegible] it was massive; the dimensions of the [illegible] were [illegible], [illegible] sections 2.25 ft. on each side, [illegible] of the Propylaea, for example. The

From the 4 th century may be discerned a tendency to exaggerate economy, which may be partly explained, both by the enlargement of the programmes, and by a diminution of material resources.

Note that according as the edifice employed the Ionic or t the Doric style, the construction comprised certain variations, some of which were relatively important.

I. The Materials.

Then the classic construction was exclusively in stone, at least when it was in the service of monumental architecture. Crude bricks always remained in favor for the walls of cities, because their resistance to blows of the battering ram was e esteemed superior to that of stone.[1]

Note 1. In the 4 th century, the bricks of which were built the walls of Athens, measured one foot on each side(0.94 ft); masonry of them was consolidated by inserting a wooden grillage in the mass.

There was no objection to the association of different materials in the same edifice. Thus the size of certain intercolumniations of that primitive epoch -- for example those of the Heraon of Olympia -- indicates, that at the beginning of the 6 th century wooden architraves were placed on stone columns. In the same epoch were freely introduced in a stone e-edifice parts in terra cotta; tiles, gutters, plates and coffers. In the decline of the 6 th century and in the first h half of the 5 th, a thoughtful programme -- there may be cited those of the first Temple of Athena on the Acropolis and of the Temple of Zeus at Olympia -- contemplated the execution in marble of the upper parts, those most lighted, of an e edifice in limestone. Finally, for the roofs was employed a great deal of wood.

Grecian carpentry does not appear to have surpassed the primitive phase, in which height was attained by placing timbers on each other. It was ignorant of the modery system of t the truss, which transforms the transverse load into tension.[2] Thus it was massive; the dimensions of its timbers were frequently enormous, comprising sections 2.29 ft. on each side, as the case at the Arsenal of the Piraeus, for example. The specifications for the Erechtheion indicate the method of con-

consolidating the framing by the aid of cramps.

Note 2. Compare what is said of the roofing on page 312.

Grecian construction was nothing less than megalithic. The blocks of which the walls were made were of more modest dimensonss; their lengths rarely exceed 4.88 ft., widths 2.44 ft., and heights 2.6 ft., and they rather kept to the corresponding dimensions of about 3.66, 1.5c and 1.37 ft.[1] Even for the stones of substructures, the lengths remained below 7.6 ft.

Note 1. Here are some dimensions of the blocks.

Selinonte,	4.55 long,	3.66 wide	and	1.83 ft. high.
Parthenon,	3.71 long,	1.57 wide	and	1.83 ft. high.
Theseion,	3.75 long,	1.56 wide	and	1.83 ft. high.
Erechtheion,	3.94 long,	3.96 wide	and	1.48 ft. high.
Arsenal,	3.76 long,	2.65 wide	and	1.41 ft. high.

Yet the Grecian quarryman knew how to cut monoliths of grand dimensions. Without mentioning these forming the shafts of the first Artemesion at Ephesus, and which measured some 55 ft., it was not rare for cylinders 21.4 to 24.4 ft. high to be quarried with a width of about one fourth, and beams 12.2 to 13.7 ft. long. They were not embarrassed by cutting those attaining 19.8 ft. (north portico of Erechtheion), 20.0 ft. (Olympeion of Athens), or 20.2 ft.(older portions of the Temple of Apollo at Selinonte).

The stonecutting was the object of the most minute care. (191). They dressed the joint surfaces to perfection, but l left on those intended to be seen a covering of the material, which the facing should remove after the completion of the c construction. They only took the precaution to establish guides for the final surface; for a block in course, this was a draft along the edge with a width of an inch or so; for the shaft of a column, it was the beginning of the flutes at the two ends of the trunk, if this was a monolith, and in the case of a pile of drums, this was at the top of the upper one and the bottom of the lower one. On the other hand, the capitals were always set finished.

With a view of economising as much as possible the labor o of the stonecutter, the ingenious minds of the Greeks early suggested to them an idea, but which they did not apply before the 5 th century; that the reducing the flat surfaces of

29/ two beds by two corresponding recesses.(192). Then the panel was slightly hollowed, only leaving in case it was rectangular a border 2 3/8 to 3 1/8 ins. wide, and where it was the bed plane of the drum of a column, the circular border had an area averaging a little more than half the total extent.[1] (192).

Note 1. Parthenon, upper drum; radius 32 3\4 ins., width of border 9 1\2 ins; Propyleion, radius of drum 17 1\2 ins., width of border 5 1\8 ins.

On the other hand, the Greeks did not hesitate to complicate the operation of cutting by methods required by a desire to facilitate in the greatest measure possible, the hoisting and setting of the blocks (193). Thus on the cylindrical surface of a drum, at the ends of two crosse diameters were left tenons, which were caught in the loops of the ropes. If it referred to a prismatic course block, the same procedure occurred on the face and back; or indeed grooves in U-shape were sunk on the end joints, that afforded a hold for the ropes, and from which they were easily drawn after setting. If the stones were of small dimensions, holes were cut from the upper bed, in which was placed a lewis.

II. The Methods.

If we except private building, which betrays negligence,[2] Grecian construction is distinguished by a rare quality of j jointingl particularly in the 5 th century, and when it employed marble.

Note 2. Thus the walls of the houses of Delos were made of two independent faces of rubble set dry and filled between w with small stones; they combine materials of unequal resistance.

The Wall.

In the 6 th and 5 th centuries, the wall is homogeneous; in the 4 th, it tends toward a composite structure of a filling between two jointed facings; such, for example, is it at the Temple of Apollo at Didyma, where two marble facings mask a filling of rubble.

Excepting for retaining walls,[3] for which it is proper on account of its stability, Grecian construction very rarely e
29 employs polygonal masonry, which it elsewhere executed in a very regular and careful fashion.

nected with the Propylaea; thus at Cnidos is observed the superposition on seven courses of rectangular blocks, of a portion of polygonal masonry, with a course similar to the c ones (184, 2).

Normally, the elevation of a Hellenic wall is divided into

Pedestal of two courses of stones set flat; above is a high base consisting of two slabs set on edge and generally secured by a base, this base being termed "orthostat" and recalling the memory of the stone facings protecting the lower zone of a wall of crude bricks, revealed to us by the Mesopotamian and Hittite architectural series, and that were also the fashion in Greece;[1] to conform to it, blocks of medium size were laid on edge, placed on their quarry beds. The orthostats slightly projected beyond the wall proper, and the base beyo-

Note 1. See pages 154, 276 and 292. The height of the or-

In all careful building the beds were rigorously level and all courses were equal or nearly so. Rarely[2] were employed the arrangement of an alternation at regular intervals of courses of two different heights. Almost always the blocks of the same course all placed in the same sense, which is that of their longest axis; it is necessary to come down to the late epoch to observe, as possible on the walls of Eleusis, a succession of long and short faces (184, 6). Sometimes the

were one of two long stones set beside each other, which were not joined together, when the use of marble incited to economy, as the case at the Parthenon. In all cases, pains were taken to break joints, and to have all those of the same course fall exactly on, or at least about the middle of the blocks of the course beneath. The joining of the two courses at right angles was by square blocks; in the 4th century stones

Note 3. Compare at Delphi, for example, the retaining wall of the terrace supporting the Temple of Apollo.(194, 2).

However Asia Minor offers examples of its methodical combination with the rectangular; thus at Cnidos is observed the superposition on seven courses of rectangular blocks, of a p portion of polygonal masonry, with a coping similar to the b base (194, 8).

Normally, the elevation of a Hellenic wall is divided tnto three parts (195); below extends a plinth, composed of one or rather of two courses of stones set flat; above is a high base consisting of two slabs set on edge and generally separated by a space, this base being termed "orthostae" and recalling the memory of the stone facings protecting the lower zone of a wall of crude bricks, revealed to us by the Mesopotamian and Hittite architectural styles, and that were also the fashion in Crete; [1] to complete it, blocks of medium size were l laid on this, placed on their quarry beds. The orthostate s slightly projected beyond the wall proper, and the base beyond the orthostate.

Note 1. See pages 133, 156 and 292. The height of the orthostate was at the Parthenon 3.56 ft., at the Erechtheion 2 2.98 ft., and at the Theseion 2.70 ft.

In all careful building the beds were rigorously level and all courses were equal or nearly so. Rarely [2] were employed the arrangement of an alternation at regular intervals of courses of two different heights. Almost always the blocks of the same course all appear in the same sense, which is that of their longer axis; it is necessary to come down to the late epoch to observe, as possible on the Temple of Labranda, a succession of long and short faces (194, 6). Sometimes the thickness of the wall is formed of a single block. More frequently were inserted between two courses of large square blocks one of two long stones set beside each other, which were not jointed together, when the use of marble incited to economy, as the case at the Parthenon. In all cases, pains were taken to break joints, and to have all those of the same course fall safely on, or at least about the middle of the blocks of the course beneath. The joining of the two courses at right angles was by square blocks; in the 4 th century appear-

[illegible]ected the best arrangement, [illegible]. 5

Note 2. These may be cited to exemplify the [illegible] and wes-
[illegible]
of Agrippa at Athens.

Note 3. It was employed at the Erechtheion in the portion constructed at the beginning of the 4th century, and at the [illegible] of the [illegible].

By a well understood economy permitted by the quality of t[illegible]
[illegible]
[illegible]
the style of the edifice was Doric or Ionic, or the whole be-
in the first case equivalent to one-ninth the height of the front, and in the second to one-eleventh; but it was custom-ary of a proportion fluctuating between the tenth and thirteenth part. For an edifice of small height, the amount was often less than 3.28 ft.; for those of medium dimensions, it was a-bout 6.56 ft., and for those very large, it exceeded [illegible] ft. It is very frequent, that while constant at all heights of a wall of an Ionic or Corinthian monument, it diminished from base to summit, though indeed in a scarcely perceptible manner, when the construction was according to the Doric mode.

We may cite the retaining walls of the terrace beneath the [illegible] of Athens as an example of the use of the buttresses, that Grecian construction knew how to make for the reinforce-ment of a wall (194, 2). These are regularly spaced 17.4 ft. apart as pilasters 2.62 ft. wide and projecting 3.28 ft, some [illegible]
[illegible].

For the Greeks the normal type of the door and the window was the opening beneath a lintel, the outline being either a rectangle or a trapezoid (Fig. 25a). Generally the sides were composed of two jambs, either monolithic or built, the sill of a window being a block similar to that serving for a lin-tel. The lintel and the sill frequently extended beyond the [illegible]
only by the [illegible] sometimes may be explained a method so subject to criticism from the structural point of view, s-ince as a result of unequal settlement of the building and [illegible].

The faces and bottoms of sills were frequently nothing

appeared the best arrangement, called L-shaped. [3]

Note 2. There maybe cited as examples the eastern and western walls of the great Altar of Pergamus, and the Monument of Agrippa at Athens.

Note 3. It was employed at the Erechtheion in the portion constructed at the beginning of the 4 th century, and at the Arsenal of the Piraeus.

By a well understood economy permitted by the quality of t the execution, the Greeks reduced the thickness of the walls to strict necessity. It further varied according to whether the style of the edifice was Doric or Ionic, on the whole bein the first case equivalent to one-ninth the height of the front, and in the second to one-eleventh; but it was susceptible of a proportion diminishing to the tenth and thirteenth part. For an edifice of small height, its amount was often less than 3.28 ft.; for those of medium dimensions, it was about 6.56 ft., and for those very large, it approached 9.15 ft. It is very remarkable, that while constant at all heights of a wall of an Ionic or Corinthian monument, it diminished from base to summit, though indeed in a scarcely perceptible manner, when the construction was according to the Doric mode.

144 We may cite the retaining walls of the terrace beneath the Olympeion of Athens as an example of the use of the buttress, that Grecian construction knew how to make for the reinforcement of a wall (194, 9). These are regularly spaced 17.4 ft. apart as pilasters 2.68 ft. wide and projecting 3.28 ft, some abutting against the surface of the wall, others being bonded into its mass.

145 For the Greeks the normal type of the door and the window was the opening beneath a lintel, the outline being either a rectangle or a trapezoid (196; 262). Generally the sides were composed of two jambs, either monoliths or built, the sill for a window being a block similar to that serving for a lintel. The lintel and the sill frequently extended beyond the jambs and were built into the body of the wall; (196; 11, 12); only by the search for appearance may be explained a method so subject to criticism from the structural point of view, s since as a result of unequal settlement of the building and the frame, it created for the latter a risk of fractuee.

The gates and posterns of cities were frequently nothing

more than a dome, for construction which was ordinarily empl-
oyed the system of corbelled courses; the shape was sometimes the more frequently one of a [illegible] (Fig. 1); sometimes that of cone figure or of a truncated above a rectangle; or again [illegible]. The mode of cove-ring it by a voussoir dome is rare, except in Asia Minor and [illegible] the geographical situati-on of the first country in relation to Etruria leads to an in-teresting and suggestive conclusion.

The Isolated Support.

[illegible] its height had a limit-ed more than 21.4 ft., as at the Temple of Corinth, or about [illegible] tively monolithic, like the wooden post required by it. This method of construction was never abandoned, at least in regard to supports of small height; but from the 6 th century became [illegible]

[illegible], the number of these "vertebrae" -- to use the expressive language of the Greeks -- increased later.[1]

Note 1. If there be taken as a term of comparison what is found at Temple C of Selinunte, and which is four or five for [illegible] the Theseion 2 1/2 times, at the Temple of Segesta nearly 2 1/3 times; then for colossal columns, like those of the Olympieion of Athens or of the Didymaion, it is respectively 1 2/3 and 1 4/5 times greater. (Selinunte, Temple C, height 28.2 ft. = 4 to 5 drums; Parthenon, height 34.7 ft. = 10 to 12 drums; Theseion, height 19.2 ft. = 7 drums; Segesta, height 30.8 ft. = 10 to 12 drums; Olympieion of Athens, height 55.7 ft. = 15 drums). The [illegible] of extreme thickness may be [illegible] this extends to from 9.4 to 10.0 ft.

Further, it was not equal for all units of the same series of supports.[2] The Greeks were too wise and had too many reas-ons for being economical to assume that an appearance of reg-ularity, -- often difficult to perceive and even invisible,

more than a hole, for constructing which was ordinarily employed the system of corbelled courses; the shape was sometimes the very elementary one of a triangle (196,1); sometimes that of this figure or of a trapezoid above a rectangle; or again that of a pointed or round arch (196,2,5,8). The mode of spanning it by a voussoir arch is rare, except in Asia Minor and especially in Acarnania (196,9,10); the geographical situation of the last country in relation to Etruria leads to an interesting and suggestive comparison.

The Isolated Support.

Whether its form was Doric or Ionic, its height was a little more than 21.4 ft., as at the Temple of Corinth, or about 55 ft., as at Ephesus, the isolated support was at first entirely monolithic, like the wooden post replaced by it. This method of construction was never excluded, at least in regard to supports of small height; yet from the 6 th century became general the system of a pile of drums.(195).

At first restrained by the prudence of the constructor, the number of these "vertebres" -- to use the expressive language of the Greeks -- increased later.[1]

Note 1. If there be taken as a term of comparison what is found at Temple C of Selinonte, and which is four or five for a total height of 26.2 ft., it is perceived that the subdivision of the shaft at the Parthenon is 2 1\3 times greater, at the Theseion 2 1\2 times, at the Temple of Segeste nearly 2 4\5 times; even for colossal columns, like those of the Olympeion of Athens or of the Didymeion, it is respectively 1 2\3 and 1 4\5 times greater. (Selinonte, Temple C, height 26.2 ft. = 4 to 5 drums; Parthenon, height 31.7 ft. = 10 to 12 drums; Theseion, height 16.8 ft. = 7 drums; Segeste, height 28.6 ft. = 10 to 13 drums; Olympeion of Athens, height 52.5 ft. = 18 drums). As an example of extreme thickness may be cited that of the drums inperfectly detached from the benches of the quarry of Selinonte, called the Cave di Compobello; t this extends to from 9.45 to 10.0 ft.

Further, it was not equal for all units of the same series of supports.[2] The Greeks were too wise and had too many reasons for being economical to assume that an appearance of regularity, -- often difficult to perceive and even invisible,

when the construction was of limestone and the shaft was masked by a covering of stucco -- was worth the loss of material necessary to pay for it.

Note 2. At the Parthenon, the height of the drums varies from 2.68 to 2.90 ft.; at the Temple of Zeus at Olympia, from 1.71 to 2.35 ft.; at Segeste, from 2.84 to 3.84 ft.

This tendency to diminish the massiveness is still more striking, when the support is observed in regard to its proportions. At first its strength is exaggerated; the classical epoch was even forced to establish a more just relation between its width and the work to be done; finally, the Hellenisic epoch inclined to slenderness. Thus while the Ionic support of the 6 th century was equivalent to a little more than 7 diameters, almost 10 are counted in some dating from the second half of the 5 th century (233). Particularly in the construction after the Doric mode is the evolution manifest; the most ancient columns are stumpy, their height being scarcely more than four diameters, measured at the base; those p produced in the 5 th century are more slender with heights to equal five or six diameters; finally from the beginning of t 4 th century it progressed until the reduction of the diameter to nearly one-tenth of the height (223). Hellenistic architecture even risked audacious proportions; thus at the Arsenal of the Piraeus, the diameter of the pillars did not exceed one-eleventh of their height.

In regard to the cutting of the capital and the base, different systems are observed according to whether one considers the Doric or the Ionic mode.

In all periods, the first comprises the form in a single block, not only all the elements of the capital, but also the part of the shaft immediately beneath. The construction according to the Ionic formula follows two ways; sometimes,[1] it cut separately the part beneath the beam and the echinus or cushion part, the last being realized by an enlargement of t the top of the shaft; more frequently, with the purpose of e economizing the waste of material and the labor required for relieving the bed of the echinus, this and a portion of the shaft was comprised in the same mass as the abacus.[2]

Note 1. In this manner was it done at the Temple of Samos

and at the north portico of the Erechtheion.

Note 2. Thus at the Propyleion, at the eastern portico of the Erechtheion, at Phigalia and at Sardes.

It did the same for the base; -- sometimes -- for example, this was the case at the Heraon of Samos and at the north portico of the Erechtheion -- it required for one part a block furnishing the base, and for another it placed a broad footing on the shaft. But for some reasons given by us in reference to the capital, from the 5 th century it preferred a distinction of the base from the shaft, that permitted the reduction of the foot of the latter to the proportions of a narrow and low projection.

For the Ionic column a vertical position was the rule. But in several Doric edifices, in the number of which figure the masterpieces of the kind, the isolated supports are not vertical. At first, all are uniformly inclined toward the wall of the cell opposite them; those of the angles belonging to two facades, their inclination is a resultant,and their direction is in the diagonal of the plan (198,1,3). Estimated at the level of the ground, the fariation from a plumb line is a minimum, scarcely perceptible to the untrained eye, but it may actually be equal to 1 1/2 ins. at the Temple of Paestum and at Egina, and to 2 3/4 ins. at the Parthenon. Besides, at the Parthenon and at the Theseion, the inclination towards the interior just mentioned is complicated for the columns of the facades by an inclination toward the middle of the row.((198,2). Economical and most ingenious, the Greeks reduced to the minimum the complications, that these peculiarities must introduce in the formation of the drums. They restricted themselves to giving the necessary slope to the upper bed of the lower and to the lower bed of the upper one, all the others remaining as cylinders perpendicular to the parallel planes, perpendicular to the axis (195,A).

To a row of isolated supports the Greeks ensured the firm bearing of a course of large slabs, that projected a little sidewise beyond the bases, and which bore the significant name of “column supports” (stylobate).(195,A; 202,3,4). That element, like all those previously considered by us, was affected by the evolution progressively reducing the massiveness

the primitive Hellenic construction. At first were employed long monoliths, each of which supported several columns; then, as attested by Temple C of Selinonte, for example, -- they r risked the fracture of a slab in the intercolumniation, the joints corresponding to the middle of the bases of the columns; the classical epoch preferred an arrangement of three squares per unit of interval, one beneath each support and the third between them; finally, the Hellenistic age even passed to a division into four slabs.

The Entablature.

Architrave. -- To span an intercolumniation the Greeks only employed the system of the straight beam, realized by means of stone beams connecting each support with the next, just 1 like wooden timbers.[1]

Note 1. To the course of these architraves was applied the name of epistyle (above the colonnade).

The desire of economizing the labor of the carrier and the setter, and also that of increasing the chances for stability by a division of the work imposed on this member, determined an evolution in its structure analagous to that observed in regard to the isolated support. At first, as proved by the Temple of Corinth, it was made of a single block; it was then composed of two or three; or indeed these were superposed -- this was the first solution (199,C,E) -- or rather as more j judicious, and which only became the normal arrangement, they were placed on edge and beside each other, relieved on their joint surfaces.[1] (199,A,B,D). For a large edifice, the length of these beams varied as an average between 13.8 and 14.8 ft., with a height of 3.28 to 4.92 ft. and a thickness of 1. 1.64 to 2.62 ft.[2]; in case of central intercolumniations or of colossal programmes, it might quite commonly reach from 1 16.4 to 18.1 ft., exceptionally exceeding 21.3 ft.[3]

Note 1. Doubled by superposition:-- archaic Temple of Metaponte; Temple C of Selinonte.

Tripled by superposition:-- Temple of Zeus at Agrigente.

Doubled side by side:-- Temple of Egina; Propyleion and Olympeion of Athens (the extremes of each facade); Temple of P Poseidon at Paestum.

Tripled side by side:-- Temple of Zeus at Olympia; Parthen-

Parthenon, Olympeion of Athens.

Note 2. For those of intercolumniations, see Chapter 6. p Pages 338, 350.

Note 3. Parthenon, 14.0 ft. long, 4.4 ft. high, 1.8 to 2.13 ft. wide.

Temple of Poseidon, Paestum, 14.75 ft. long, 4.92 ft. high, 2.4 ft. wide.

Propyleion at Athens, 17.8 ft. long, 3.77 high, 2.36 ft. wide.

Olympeion of Athens, 21.5 ft. long, 3.38 ft. wide.

The bending stress imposed thereon may be appreciated by n noting that the pair of beams forming the middle architrave of the Propyleion of Athens -- actually supported at each end for a length of 2.0 ft. by the capital of the support -- supported on a total area of 101.0 sq. ft.(17.8 × 5.65 ft.) a l load of about 95.5 tons, the cross section measuring 5.06 sq.ft.

At the angles of a colonnade, the architraves were sometimes joined by contact, sometimes by partial intersection. If they were doubled, those of the lower series were butted and mitred.(203,3).

Frieze. -- When the elevation of an Ionic monument comprised a frieze, that was composed of a series of blocks. On the lontrary, the Doric frieze was subdivided, sometimes extremely so; otherwise the construction varied according to the edifices. In a general way, it was divided lengthwise into two faces, the external exposing an alternation of projections and recesses termed triglyphs and metopes, [1] the internal having a continuous surface. When the construction was in l limestone, these adjoined each other (199,B); if it was in m marbel, to econimize the material and lessen the load on the architrave, their thickness was reduced, so that between them extended a kind of space, whose width is from 8 to 14 ins. at the Parthenon (199,A). The mode of construction of the outer face varied greatly. Ordinarily it was composed of a single course; yet examples exist -- and one of these is presented by one of the masterpieces of Hellenic architecture, the Temple of Poseidon at Paestum -- of a facing in two courses. [2] As for the longitudinal arrangement, two systems competed; o one restricted the number of blocks and simulated in the cutting the theoretical independence of the triglyphs and metopes;

[illegible]tions.[3] -- which was released from the latter were sculptured, having the advantage of setting them separately after finishing their ornamentation -- formed a series of panels and alternating slabs; these were connected to the triglyphs by inserting their edges into grooves cut in the sides of the triglyphs.[4] (Ref.57). Sometimes, as the case of the Parthenon, at some distances behind the metopes was set a block of the same material to strengthen it.

[illegible]

Note 3. Note that this refers to the occurrence of metopes [illegible]

Note 4. As an ancient example may be cited the "Basilica" at Paestum, where the independence of the triglyphs is attested by their simple corners.

[illegible]

Through this diversified and measurable disjointed arrangement, as it seems to be known, of the elements of the Doric Frieze was counteracted by the weight of the cornice, which the Greeks successively dominated the crown.(Hesse).

Cornice. -- Although the dimensions of Grecian cornices are not same, Hellenic architects multiplied precautions for protecting the facades from the flow of water shed by the roofs. A first one was to project the cornice strongly beyond the face of the frieze;[1] a second, not observed by construction according to the Doric method, was to groove the outer face with one or more deep grooves suited to catch the drops; the third consisted in giving the lower plane a pronounced inclination toward the exterior, affording a beak profile to throw off the water (Ref.).

Note 1. The overhang of the projection is 1.83 ft.; at the north portico of the Erechtheion being 1.11 ft.

The cornice was normally composed of a single course of large slabs balanced on the front and rear faces of the frieze and sometimes projecting one-third of their length. On the eastern and western fronts, whose pediments were filled with [illegible] ion was increased by the fact of a considerable load. This

the other [3] -- which was imposed when the latter were sculptured, having the advantage of setting them separately after finishing their ornamentation -- formed a series of prisms a and alternating slabs; these were connected to the triglyphs by inserting their edges into grooves cut in the sides of the triglyphs. [4] (203,2). Sometimes, as the case of the Parthenon, at some distance behind the metope was set a block of the same height to strengthen it.

Note 1. For the arrangement of the sculpture of the frieze, see the Chapter relating to the Effect, page 344.

Note 2. Note that this refers to the occurrence of monuments in limestone, where the masonry was masked by stucco.

Note 3. As an ancient example may be cited the "Basilica" at Paestum, where the independence of the triglyphs is attested by their disappearance.

Note 4. At the Parthenon, the grooves are 6 ins. wide and 1 1\4 ins. deep.

Indeed this diversified and measurable dispersed arrangement, as it might be termed, of the elements of the Doric frieze was consodilated by the weight of hhe cornice, which the Greeks expressively denominated the crown.(Geison).

Cornice. -- Although the climates of Grecian countries are not damp, Hellenic architecture multiplied precautions f for protecting its facades from the flow of water shed by the roofs. A first one was to project the cornice strongly beyond the face of the frieze; [1] a second, not observed by construction according to the Ionic method, was to provide the outer face with one or more deep grooves suited to catch the d drops; the third consisted in giving the lower plane a pronoounced inclination toward the exterior, arranging a beak profile to throw off the water (201).

Note 1. The overhang at the Propyleion is 1.33 ft.; at the north portico of the Erechtheion being 1.14 ft.

The cornice was normally composed of a single course of thin slabs balanced on the front and rear faces of the frieze and sometimes projecting one-third of their length. On the eastern and western faces, whose pediments were filled with statues, the danger of breakage resulting from such a projection was increased by the fact of a considerable load. This

manner was adapted for by [illegible] the rest of the column o
over the columns by two wedges; first about the middle by t
that of the wall serving as a [illegible] for the sculptures,
and which sometimes -- as on the Parthenon, the Erechtheion and
the temple of Aegina -- consisted of slabs set vertically, se-
cured of a wall erected in courses; then by a pile of blo-
cks mounted on the wall on top.(Fig A B).

On these two factors rested the raising control of the pedi-
ment, which was a repetition of that of the entablature. The
danger for it was the sliding of its parts; this did not fri-
ghten the Grecian constructor, who limited himself to strong-
ly clamping the slabs to their support.(Page 306). The test
of time has not proved him to be in error.

If a Doric colonnade was inclined toward the interior of the
the edifice, the same slant affected the architrave, the fri-
ze and cornice above it, though in less degree; thus at the
Parthenon, the variation from the vertical is 2 3/4 ins. for
the columns, but is only 15/16 in. for the entablature. Inv-
ersely the Ionic mode freely inclined the upper parts forward,
(Pl,c). 2

On these points, see further Chapter 5, III, page 327.

The Methods for Consolidation.

For a Grecian structure the general conditions of stabil-
ity were quite analogous to those found in an Egyptian construc-
tion. In both was the great advantage of the absence of [illegible]
[illegible] resulting from the exclusive use of the ar-
chitrave for the supported portions of the edifice. Likewise
in both, one should mistrust the ground, weakened on the ban-
ks of the Nile by infiltration, and exposed to earthquakes in
the area of Hellenic civilization. Yet walls in Egypt prote-
[illegible]
supports, it was opposed in Greece by the slenderness of both.

A. Foundations. -- The Greeks devoted more care to foun-
dations than the Egyptians. In a general way, they desired
a safe bearing, as much as possible that of the rock, and so
they carried the substructure down as far as necessary. On th-
is point as on all others, their practice was rational, in a
accord with the logical turn of their temperament and w

danger was prepared for by loading the rear of the cornice o over the columns by two weights; first about the middle by t that of the wall serving as a background for the sculpture, and which sometimes -- as on the Parthenon, the Theseion and the Temple of Egina -- consisted of slabs set vertically, sometimes of a wall erected in courses; then by a pile of blocks, bonded to the wall or not.(199,A,B).

Note 1. At the Propyleion, the thickness varies from 0.92 to 1.20 ft.

On these two facings rested the raking cornice of the pediment, which was a repetition of that of the entablature. The danger for it was the sliding of its parts; this did not frighten the Grecian constructor, who limited himself to strongly clamping the slabs to their support.(Page 306). The test of time has not proved him to be in error.

If a Doric colonnade was inclined toward the interior of t the edifice, the same slant affected the architrave, the fireze and cornice above it, though in less degree; thus at the Parthenon, the variation from the vertical is 2 3/4 ins. for the columns, but is only 13/16 in. for the entablature. Inversely the Ionic mode freely inclined the upper parts forward. (201,8). [2]

On these points, see further Chapter 5, III, page 327.

The Methods for Consolidation.

For a Grecian structure, the general conditions of stability were quite analagous to those found in an Egyptian construction. In both was the great advantage of the absence of l lateral thrusts, resulting from the exclusive use of the architrave for the supported portions of the edifice. Likewise in both, one should mistrust the ground, weakened on the banks of the Nile by infiltration, and exposed to earthquakes in the area of Hellenic civilization. Yet while in Egypt protection was facilitated by the massiveness of the walls and the supports, it was opposed in Greece by the slenderness of both.

A. Foundations. -- The Greeks devoted more care to foundations than the Egyptians. In a general way, they desired a safe bearing, as much as possible that of the rock, and they carried the substructure down as far as necessary. On this point as on all others, their practice was rational, in a accord both with the logical turn of their temperament and w

[illegible] the necessity of economizing effort found by them. Alm-
ost always, they did not uniformly excavate the entire extent
to be occupied by an edifice, but merely the bed of detached
portions.[1] In the case of a damp site, the Greeks commenced
[illegible]
Ephesus was composed of a bed of charcoal about 2 3/4 ins. t
thick placed between two layers of mortar. But we add that
frequently the foundation, properly so called, was strictly
[illegible]
merely filled; they were even inclined to content themselves
with a rough mass of concrete of small stones connected by a
bad mortar.[2] (427,3). It is proper to regard as a second in-
[illegible]
[illegible] base of the temple (432,a).

Note 1. Thus at the temple of Olympia, toward the east,
[illegible]
*is reduced in height to a single course; it measures 8.3 ft.
toward the west, where the ground is pebbles and alluvium.*
[illegible]
[illegible] rests directly on the rock, while under that of the
[illegible]

*Note 2. Exception should be made for the Parthenon, whose
substructure is massive and is made of dressed stones. In a
fragment of the specifications for the foundations of a Temp-
le on the island of Lesbos, published by Choisy (Etudes, p.*
[illegible]
*ground intended to receive the foundation, the contractor sh-
all clear it away to give place to a larger stone."*

Bonding of the Materials. -- Yet in the judgment of the
Greek constructor, nothing equaled a strict bonding of the m
aterials. Like his predecessors in Egypt, he did not demand
only from the adhesive power of the mortar; he preferred to
obtain it by realizing the true causes of adherence, consist-
ing in the first place by a contact of the joined blocks as
perfect as possible; in the second their union by dowels;
in the third place, their connection by cramps.

The success of the first of these means has for conditions
[illegible]
ting. We have previously noted the minute care given to a

with the necessity of economizing effort found by them. Almost always, they did not uniformly excavate the entire extent to be occupied by an edifice, but merely the bad or doubtful portions. 1 In the case of a damp site, the Greeks commenced by establishing a pavement; that supporting the Artemesion of Ephesus was composed of a bed of charcoal about 2 3/4 ins. t thick placed between two layers of mortar. Let us add that frequently the foundation, properly so called, was strictly localized beneath the walls and columns, the intervals being merely filled; they were even inclined to content themselves with a rough mass of boulders or small stones connected by m mud mortar. 2(203,3). It is proper to regard as a second foundation beneath the open sky the mass of the stylobate, the actual base of the temple (202,4).

Note 1. Thus at the Heraion of Olympia; toward the east, where the soil is sound, the masonry underlying the edifice is reduced in height to a single course; it measures 8.5 ft. toward the west, where the ground is pebbles and alluvium. Likewise at the Parthenon; the northeast angle of the substructure rests directly on the rock, while under that of the southwest, the substructure was extended to a depth of 35.3 ft.

Note 2. Exception should be made for the Parthenon, whose substructure is massive and is made of dressed stones. In a fragment of the specifications for the foundations of a Temple on the island of Lesbos, published by Choisy (Etudes, p. 228), it is stipulated:-- "If there are soft places in the g ground intended to receive the foundation, the contractor shall clear it away to give place to a larger stone."

Bonding of the Materials. -- Yet in the judgement of the Greek constructor, nothing equaled a strict bonding of the m materials. Like his predecessors in Egypt, he did not demand this from the adhesive power of the mortar; he preferred to obtain it by realizing the three causes of adherence, constituted in the first place by a contact of the joined blocks as absolute as possible; in the second their union by framing; in the third being their connection by clamps.

The success of the first of there means has for conditions two perfections in the cutting of the stones and in their setting. We have previously noted 2 the minute care given to b

both these operations by the Greeks. (Pages 289 - 191). The results obtained were magnificent, whenever the programmes c comprised sufficient resources; at the Parthenon, the blocks composing the substructure of the edifice are so perfectly a adjusted, that even today one frequently has some difficulty to perceive the joints.

The second system was freely used by the Greeks and consisted in the application to stone of methods suited for carpentry and even joinery, such as housing by tongues and grooves, joining by tenons and mortises, fastening by cross-beams bent at their ends.(203).

Finally, nothing is more characteristic of Grecian construction than its procedure, -- notable in all epochs but especially starting from the classical -- of ensuring the adherence of the elements of the building by the use on a large scale, of various clamps, striving to preserve the relative positions of two superposed courses, and others the contact of two adjacent blocks. The former were usually prismatic or cylindrical joggles extending halfway into each of the two adjoining stones.(204,1-4,6). They were sometimes made of hard wood, ash or olive, that was sometimes coated with pitch, but more frequently of iron and exceptionally of bronze. Their use was very particularly indicated for the slabs of the raking cornices of the pediments, exposed to sliding, and for the d drums of columns in countries subject to earthquakes, which ran the twofold risk of lateral displacements and of rotation, that would have dertroyed the correspondende of the flutes. This danger was provided against by cutting at the centres of the two beds holes of rectangular section, in which was inserted a block of wood or of metal serving as an axis, and prevented from rotation by its shape (204,9,11), or better still, as at the Olympeion of Athens, for example, by arranging two or four of these dowells.(204,10). It is remarkable, that t the lower drum of a Doric column was hardly ever clambed to the stylobate. [2]

Note 1. That was the mode in Sicily and also for the columns of the Parthenon.

Note 2. An exception may be cited in the columns of the T Temple of Herakles at Agrigente and those of the Temple of A Athene at Pergamus.

The cramps, of which Grecian construction was not sparing, were of various shapes, either dovetail, I or even Z (204,5,8). Like the tenons, they were set in lead, both to fix them f firmly in their places and to protect them from oxidation. W When it concerned the junction of two courses, the ordinary method consisted in fixing the joggle in the bottom bed of t the upper course, and after the setting was finished, melted metal was run in by a narrow channel cut in the bed of the l lower block.(204,1,2,3). The sketch X of Fig. 204 indicates the procedure for a column.

The Pavement.

For the pavement, three systems were in competition. Sometimes it was a floor of slabs with areas measuring 10.8 to 16.2 sq. ft. and a thickness of 8 to 10 ins., either set on the m mass of the substructure, or more rarely on a grillage of blocks, [1] an example of which is offered by the Temple of Phigalia.(202,4). Quite frequently -- thus at the Temple of Zeus at Olympia, and it was the fashion for houses -- a mosaic set in mortar, either arranged with pebbles, or in the Hellenistic epoch with cubes of marble. Sometimes, as shown by the T Temple of Ægina, an area was composed of stucco. As for the floors at considerable height above the ground, they were realized by means of a series of large beams fixed in the walls or borne by supports, with transverse joints and planks.

Note 1. At the Parthenon, the slabs measure 3.9 x 5.7 ft., and their thickness is 8 1\4 ins.

The Methods of Covering.

What is known of Grecian coverings announces an ingenious solution of this problem of construction, logical, simple, p practical and original in large measure.(206; 207; 208).

Sometimes, as attested by the specifications of the Erechtheion and the fact, that certain remaining tiles are decorated on the lower surfaces, the edifice received only a roof, visible from the interior; sometimes, on the contrary, the r roof was masked by a ceiling.

In a monument with a peristyle, the portico, in regard to c construction was entirely independent from the cell, that it surrounded. Yet the roof was common to both, and viewed from the exterior, it presented the appearance of a canopy suppor-

supported by a colonnade.

Ceiling. -- The construction of the Grecian ceiling permitted its execution in stone as well as in wood; the latter comprised the use of precious species, such as cedar and cypress, and was the rule, excepting for covering the porticos of elegant edifices of the classical and the succeeding periods, for which were preferred stone as a material.

Then there was a choice between several methods of construction.

A first offered the advantage of being utilized, even for a wide span, and had as an essential element a series of beams, called girders, placed over the space to be covered, according to its samller axis and at equal intervals. [1] (206,1-4). To enclose the intermediate spaces, two systems were in competition. For example, one was applied to the eastern and western porticos of the Parthenon, to the southern porch of the Erechtheion, and to the entire portico around the Temple of Phigalia, merely slabs being employed.(206,164). The other was adopted for the covering of the Erechtheion, and placed transverse beams on the girders to form a grille. The rectangular bays thus formed were closed according to the arrangement of the "coffer", either directly by means of a slab, which sometimes was of terra cotta (206,3), or with two recesses, first by a reduction of the opening by a series of gradually smaller frames, then by placing a slab.(206,5).

Note 1. At the Parthenon, their length was 14.3 ft. with a breadth of 3.7 ft. and a height of 1.77 to 1.97 ft.

A second type of ceiling -- it was chosen for the side porticos of the Parthenon, for example, -- was only suitable for openings of small dimensions, for it consisted only of a course of slabs.(206,3,4).

In any case, like the slabs of the coffers, these were reduced in weight as much as possible by sculpturing their lower plane and by roughing off their upper surface.

Main beams, cross beams and panels, whether the material w was stone or wood, were fitted together by tenons and mortises; as for the slabs and the coffers, their edges rested in a rebate formed in the tops of the grillage of supporting frames.(203,1; 206,3,5).

Egyptian.
Mastaba. Pyramid. Temple. Obs.
Assyrian.
Materials. Temples palace.
Persian.
Tombs palace
Grecian. prehistoric, at Mycenae, Tyrins.
Temple plan. Roof. Orders. Diminution.
Entasis. Arch.
Olympia. Athens. Theatre.
Etruria.
Temple. House. Tomb.
Roman
Materials. Orders. Orders in Series.
Vaults. Italian Temples. Amphitheatre.
Circus. Forum. Houses. Aqueducts. Tombs.
Basilica
E. Christian.
Church. Catacomb. Roman Ch.
Byzantine.
Church. Dome. Capital.
Mohammedan.
Mosque. Minaret. Tomb. Jerusalem

Vault. -- In the present state of knowledge, it may be stated that in Hellenic countries, the solution of the problem of covering by the use of the vault was still more exceptional, than that of spanning an opening by the expedient of the radial arch. It is merely that Greece proper offers us very rare applications of slabs inclined against each other above a rectangular opening, as at the archaic Temple on Mt. Cynthos on Delos, or as a pyramid over a polygonal interior,
311 as at the "Tower of Winds" at Athens.(207,1,2). It is necessary to pass into Asia Minor and at least to come down to the 2nd century B. C. to find at Pergamus a species of tunnel vault, whose execution still betrays timidity, and another of a cross vault by the incomplete intersection of two tunnel vaults at the same level. [1] (207,3).

Note 1. The tunnel vault covers a stairway; to avoid joints at the junctions of the compartments, the constructor took care to place the crowns of his vaults at different heights. As for the cross vault discovered in a tomb, said to be that of Telephos, it was executed in a practical fashion.

Roof. -- In spite of an extreme scarcity of monumental documents, the examination of the painted or sculptured representations, the interpretation of specifications, like those of the construction of the walls of Athens and of the Arsenal of Piraeus in the 4 th century, and finally the consideration of the indications furnished by the upper parts of certain t temples, notably that of Poseidon at Paestum, permit the formulation of a very probable hypothesis concerning the structure of a Grecian roof.

For the house, particularly in Asia Minor, there was competition between the terrace of tamped earth and the roof in t two slopes (208,1,2); the adoption of the last type for large edifices was the rule, either realized as on the walls of Athens mentioned above, by covering with tiles a mass of clay arranged with a triangular section, or rather by fixing the covering on a framework of wood.

312 As we have noted (page 188), Grecian carpentry knew no other system than that of setting timbers to produce a load. E Excepting in the case of the existence of a central internal colonnade, the indispensable points of support of the ridge,

in its course between the pediments, was furnished by cross beams resting either on the walls or on the entablatures of the internal colonnade. The use of rigid woods of resinous species permitted spans of more than 50 ft. [1]; now with the exception of colossal edifices, like the Temple of Apollo at Selinonte, it was necessary for the width of the inteeior or of the aisles to attain that dimension. [2] On the ridge at one end and at the other on the longitudinal walls, rested inclined rafters upon which was laid the covering of tiles. These rafters were supported at one point of their length, when the plan of the cell comprised two rows of isolated suppports, a and by the wall of the sanctuary, when the edifice was flanked by porticos (208,3,5,6). Prudently were employed timbers of very great dimensions; at the Temple of Poseidon at Paestum, the rafters measured 8 3/4 ins. square and the gains for the great beams announce sections of 2.0 × 2.36 ft., and which elsewhere the specifications of the Arsenal at the Piraeus fixed at 2.46 ft.!

Note 1. Tie-beams of the Cathedral of Messina = 49.3 ft.; of that of Monreale = 47.0 ft.

Note 2. Middle aisle of the Parthenon = 32.2 ft.

The covering of the roof leads to the same observations as the cornice; like that, it forms an organ perfectly adapted to its function, perfected to the least details, to a point, that the precautions manifested by it are found rather excessive, with regard to the dryness of the climate. It was early made of tiles. These were sometimes placed directly on t the framework of carpentry, sometimes a covering of boards was interposed, or again -- as we learn from the specifications for the Arsenal of the Piraeus -- is the arrangement of a sheathing of boards and a filling of earth, very suitable to prevent the heating of the carpentry.(208,2).

The tiles were at first in the form of flattened half cylinders (209,1), then being large and thin plates with edges turned up. [1] From the ridge each row lapped over the one next below, so as to prevent leakage; on the upper edge of each p plate was even made a ridge as an obstacle to the ascent of the water by the wind or by capillarity. The joined edges were held by semicircular or triangular cover tiles, superp-

[illegible]

[illegible] (3,1). [illegible]

[illegible]

cessed to form a rebate between [illegible], that compelled the wa-
ter to descend [illegible] about.(209,4; 191,5,8; 206; 260; 257). As for the back of each stone, sometimes -- it was so at the Parthenon, Poseidon, temples of Eleusis and Temple of Aegina -- it projected slightly beyond the cornice; someti- [illegible]

[illegible] fig. 29).

[illegible] 3.83 ft., for a width from 1.81 to 1.61 ft., with an average thickness of 1 5/8 inch.

From the first half of the 5 th century, the tiles [illegible] of these tiles given by the existence of a certain [illegible] of Aegina; [illegible] of the 5 th century their [illegible].

Note 2. The tiles of the Parthenon were [illegible] ft. long, [illegible] ft. wide, and [illegible] ins. thick at the middle and [illegible] at the [illegible]. The cover tiles of the same length were [illegible]

[illegible], the edges of the [illegible] on which they [illegible] were left slightly rough. So many proofs of the con- [illegible] of the Hellenic [illegible]

[illegible] century in detail

Ionic or Doric, the Greek [illegible] conceived as a [illegible] translation into stone of an original system of carpe-
[illegible] supports, of horizontal and transverse beams for the [illegible]

[illegible] surfaces [illegible] is supported [illegible].

The hypothesis [illegible] the authority of the ancients [illegible] and [illegible] that the primitive colonnades were in wood,

[illegible]

superposed in the same manner. It was not the same for the upper rows on both sides of the ridge.(209). Minute precautions were taken to prevent water from running down over the facades. Along the rake of the pediment the end tiles were raised to form a border termed a cyma, that compelled the water to descend to an outlet spout.(209,4; 199,A,B; 205; 255; 257). As for the last row of each slope, sometimes -- it was so at the Parthenon, Theseion, Temple of Phigalia and Temple of Egina -- it projected slightly beyond the cornice; sometimes, as the fashion in Sicily, it rested on a gutter furnished with spouts,made of terracotta and later of limestone. (255; 156; 257).

Note 1. These dimensions varied; for a length from 2.62 to 3.61 ft., for a width from 1.31 to 1.64 ft., with an average thickness of 1 5\8 inch.

From the first half of the 6 th century, the terra cotta t tiles were competed with by those in marble, the honor of the invention of these being given by the ancients to a certain Byzes of Naxos; from the beginning of the 5 th century their use was intended for every careful programme. [2]

Note 2. The tiles of the Parthenon were 2.52 ft. long, 2.21 ft. wide,and 1 5\8 ins. thick at the middle and 2 3\8 at the edges. The cover tiles of the same length were 9 1\2 ins. w wide, hollowed out to half their thickness, and to facilitate covering, the edges of the tile and the border on which they were set were left slightly rough. So many proofs of the conscientiousness and ingenuity of the Hellenic constructor!

III. Was the Structural System of the Greeks one of Carpentry in Stone?

Ionic or Doric, the Grecian portico might be conceived as a free translation into stone of an original system of carpentry, i.e., of a combination of trunks and posts for the isolated supports, of longitudinal and transverse beams for the covering, of small beams designed to provide a transition between the smallness of the bearing surfaces and the greatness of the surfaces supported.(210).

The hypothesis is based on the authority of the ancients a and on the fact, that the primitive colonnades were in wood, and that the spacing of the supports of certain ancient peri-

peristyles presupposes architraves of that material.

Yet we have seen that it is no less than indispensable for the explanation of the structural system of Hellenic architecture.

Chapter 5. The Effect.

1. Effects of a Monumental Order.

In all parts of its area and at all epochs of its history, Grecian architecture attached at least as much importance to the qualities of appearance as to those of fitness and of construction.

Not only did it passionately follow the best shapes of the mass and of the members of the edifice; but again there exists no kind of monumental decoration of which it has not made use. This definition always comprises some distinctions; the love of effect was always more vivid among the Ionians than with the Dorians; it was more developed after than before t the change from the 5 th to the 4 th century, and Hellenism in its decline passed into excess; to the Attic school of the second half of the 5 th century belongs the palm of taste.

Considered in its higher manifestations, even in the entirety of its works, Grecian architecture appears in regard to m monumental expression, to have made more of what is refined and harmonious, than of what is powerful and contrasted.

I. Effects of Picturesque or Affective Order.

Indeed it seems, that even if they had not been forbidden by the social and economic conditions of their production, (page 258), the effects resulting from material greatness would not have obtained favor, particularly when it proceeded according to the Dorian ideal. Its most ample programmes -- in regard to the temple, they did not exceed a half dozen -- were anything but colossal. The most ambitious, that of the Olympeion at Agrigente, did not require it to occupy more than about 67,800 sq. ft. in area, nor to have a height of more than 118 ft. above its base. The platform supporting the Parthenon, the national monument of an ardent people, grandly c conceived and without limitation of resources, covers only about 23,100 sq. ft., and the edifice does not raise its ridge higher than 57.5 ft. More than three of its size might be p placed on the area of a Gothic cathedral like that of Amiens. (211,A). As for temples of average dimensions, they were properly small structures. [2] Finally the category of very small buildings was numerous, on the scale of the Temple of Athena Nike, whose facade did not exceed 18.0 ft. and whose cell oc-

[illegible]
[illegible] of the decades of temples reveals the [illegible] of the [illegible]-
[illegible]
to a certain point of the requirements of construction, and of [illegible] of the construction of buildings with architraves; a se-ries ranging from [illegible] to [illegible] ft. includes most of the great temples; another from [illegible] and [illegible] groups a [illegible] number of buildings of average proportions. Finally, [illegible] interference of [illegible] the influence of [illegible] without [illegible] it as it [illegible] in [illegible] of [illegible], [illegible] to point out the endeavor for an [illegible] of [illegible], it [illegible] in the [illegible], by means of [illegible] of the columns of the [illegible] and [illegible] by a reduction of [illegible] as in the [illegible].

[illegible]

[illegible] (Doric), 56,000; the Olympieion of Athens, founded with a view of execution in the Doric mode, realized in the Corin-thian, 47,150 sq. ft.

Note 2. That of [illegible], which may be taken as the [illegible] the middle piece measured no more than 10.72 ft. in width.

[illegible] of [illegible]; 44.0 ft., Great temple of Akropolis, Athens; 83.0 ft., Temple of Corinth; [illegible] ft., Temple at Segesta; [illegible] ft., Temple [illegible], Selinunte; 72.7 ft., Temple [illegible], Selinunte.

[illegible]; [illegible] ft., [illegible] of Apollo; 43.0 ft., [illegible]

11. [illegible] of [illegible].

No more than [illegible] to [illegible] with [illegible], [illegible] Hellenic architecture [illegible] on [illegible] imagination or feeling, to ex-press [illegible] originality, and to [illegible]

occupied less than 172 sq. ft.! A classification of the lengths of the facades of temples reveals the taste of the Grecian architects for certain dimensions, otherwise determined up to a certain point by the requirements of composition and by those of the construction of porticos with architraves; a series passing from 62.2 to 78.7 ft. includes most of the great edifices; another with limits of 32.8 and 49.2 groups a good number of monuments of average proportions; [3] Finally, around 164.0 ft. vary the colossal facades.(212) [4] And no artifice intervenes to create the illusion of greatness without the r reality; it is at most in this order of ideas, that we can p point out the endeavor for an appearance of depth, in the case of a colonnade in two rows, by means of reducing the diameter of the columns of the second row, and likewise sometmies by a reduction of their height, as at the Parthenon.

Note 1. The Heraon of Samos (Ionic) covered about 64,500 sq. ft.; the Temple of Apollo (G.T.) at Selinonte (Doric), 59,150; the Didymeion (Ionian), 58,000; the Artemesion,of Ephesus (ionic), 56,000; the Olympeion of Athens, founded with a view of execution in the Doric mode, realized in the corinthian, 47,400 sq. ft.

Note 2. That of Aphaia at Egina, which may be taken as the type, was 44.8 ft. wide, 94.0 long, and a little over 31.2 ft. high; its sanctuary did not exceed an area of 775 sq. ft., a and its middle aisle measured no more than 10.72 ft. in width.

Note 3. 62.4 ft., Heraon of Olympia; 62.4 ft., Aphrodision at Aphrodisias; 64.0 ft., first Temple of Acropolis, Athens; 69.0 ft., Temple of Corinth; 75.5 ft., Temple at Segeste; 77.3 ft., Temple D, Selinonte; 78.7 ft., Basilica, Paestum; 78.7 ft., Temple C, Selinonte; 78.7 ft., Temple S, Selinonte.

Note 4. 34.6 ft., Metroon at Olympia; 36.1 ft., portico of Erechtheion; 39.0 ft., Asklepion of Epidauros; 43.2 ft., Temple on Cape Sunion; 44.3 ft., Theseion; 44.8 ft., Temple on Egina; 46.0 ft., Temple, Assos; 47.0 ft., Temple, Phigalia; 47.2 ft., Temple of Demeter, Paestum.

II. Effects of Monumental Relief.

No more than it desired to strike with stupor, did Hellenic
319 architecture aim to act on the imagination or feeling, to ex-
320 cite curiosity by a novelty or originality, and to entertain

it by variety. An examination of the general relief of the Grecian monuments reveals that it was always very simple, exclusive of movements of the mass, accidental outlines, effects of height, prespective or of light and shade. It was singularly uniform and monotonous. For all edifices having the same purpose, the general conformation was similar. For all those of the same style, the arrangement was constant, whatever the dimensions; great or little, a temple facade comprised exactly the same elements. Finally, in the matter of architectural composition, Hellenic invention was reduced in the course of a career of eight or nine centuries to two variations on a single theme; two modes of elevations for a portico, the Doric and the Ionic. The proportioning in various dimensions of the generatrices of the same sort of surfaces or of the same species of masses varied only within quite narrow l limits. Always Grecian esthetics never admitted the necessity of a fixed ratio between two dimensions comparable together, and the artistic diversity of the Hellenic world as well as its historical evolution found itself reflected by variations peculiar on the one hand to Sicily, Greece and Asia Minor; on the other to the archaic times, to the classical age, and to the Hellenistic epoch.

The rectangular outline of the plan is the rule, and it appears more or less elongated for similar widths and according to the edifice, and up to a certain point, according to epochs and styles. An inventory of the monuments arranged from this point of view reveals the possibility of a relative classification. A first category is composed of archaic temples, whose principal axis is between 2 2/3 and 3 times the smaller one; [1] a second comprises the productions of the classical a age, numerous and most important, [2] the ratio of the facade to the side varying between 1 to 2 1/4 and 1 to 2 2/3; a third is characterized by the fact, that the longer dimension contains from 2 to 2 1/4 times the smaller, grouping together small Doric monuments of the 4 th century, [3] colossal structures of the 5 th as well as of the 6 th century, [4] and some of the best qualified representatives of the primitive and t the Hellenistic Ionic style; [5] finally a fourth consists of the Ionic and Corinthian edefices, whose side is less than

twice the facade, until it is measured by 1 1/2 times the latter.[6]

Note 1. See the Temples of Selinonte, that of Artemis at Syracuse, and the Olympeion at Athens.

Note 2. See the Parthenon, Temple of Zeus at Olympia, Theseion, Temples of Concord at Agregente, Poseidon at Paestum, and Temple of Segeste.

Note 3. Such as the Asklepion of Epidauros and the Metroon at Olympia.

Note 4. Olympeion of Agrigente, Temple of Apollo (G.T) of Selinonte.

Note 5. See the Heraion of Samos, Artemesion of Ephesus, Didymeion, and Aphrodisaion at Aphrodisias.

Note 6. Such as the Temple of Zeus at Labranda, that of A Athene Polias at Priene (1 9\10); those of Aizani, Magnesia on Meander (1 3\4); the Sanctuary of Athena Nike and the "Monument of the Nereids"(1 1\2).

If in case of a plan comprising a peristyle, for the point of view of the dimensions there be substituted that of the n number of isolated supports, the following ratios are obtained, whose correspondance with those of the measures cannot be absolute, since the intercolumniations are not equal. -- Note that the angle columns are counted twice.

Temple of Artemis at Syracuse	6 × 17 cols.
Temple C at Selinonte	6 × 17
Heraon at Olympia	6 × 16
Temple of Corinth	6 × 15
Temple of Phigaleia	6 × 15
Temple of Poseidon at Paestum	6 × 14
Temple S at Selinonte	6 × 14
Temple D at Selinonte	6 × 13
Temple of Zeus at Olympia	6 × 13
Temple of Concord at Agregente	6 × 13
Theseion at Athens	6 × 13
Temple of Athena on Acropolis	6 × 12
Temple of Aphaia at Egina	6 × 12
Metroon at Olympia	6 × 11
Asklepion at Epidauros	6 × 11
Temple of Labranda	6 × 11

Temple of Athena at Priene	6 × 11
Olympeion at Agrigente	7 × 14
Olympeion at Athens	8 × 20
Artemeseinn at Ephesus	8 × 20
Temple of Apollo at Selinonte	8 × 17
Parthenon at Athens	8 × 17
Aphrodision at Aphrodisias	8 × 15
Artemesion at Magnesia	8 × 15
Temple of Aizani	8 × 15
Basilica at Paestum	9 × 18
Didymeion	10 × 21

The accepted form of the Grecian temple results from the superposition on a truncated pyramid with steps -- the stylobate, an oblong rectangle -- of the body of the deifice, with finally a triangular prisg resting on its facades -- the roof.

The facade had as a primary characteristic its moderate development in the vertical direction.(202). The greatest slenderness -- for example such as that of the Temple of Athena Nike at Athens -- scarcely extends to an excess of the width by the elevation.(212,E; 164). At the Parthenon the height of the elevation, measured from the platform to the apex of the pediment, is little more than 5/9 of the length of the colonnade. This peculiarity of height is so much more accented, since the top of the edifice is pointed in but a slight degree, for the rise of the pediment is never more than 1/7 its base, and it is sometimes diminished to even 1/10. [1]

Note 1. Nothing better expresses the Grecian conception of the proportions of an elevation, than the graphical comparison of two facades of very nearly equal widths, as that of the Temple of Apollo at Selinonte of 160.3 ft., and that of the Cathedral of Chartres of 156.2 ft.; while the former terminates at about 98.4 ft. with a very obtuse angle, the latter e elevates the apex of an acute gable to 180 ft. above the ground, the points of its spires being at 350.0 and 383.0 ft. 1 (211,C).

342 A second trait in the form of the Grecian edifice is, that it is relatively lower as it is wider. [1] The unequal development of the two dimensions is explained by the necessity of protecting the appearance of the portico portion, to which

Grecian esthetics firmly adhered; since its height could not be increased beyond an altitude already quickly reached without increasing the diameters of the isolated supports, and b because the distances between these was narrowly limited by the small span of a stone architrave, the intercolumniations would have taken the appearance of actually narrow openings. It is no less true, that the ratio of the height of the facade 313 of the Parthenon is at the extreme limit accepted by the eye, and that from this point of view long Grecian facades, for e-example that of the Telesterion of Eleusis, were subject to criticism.

Note 1. In that respect, nothing is more edifying than a comparison of the facades of the Temple of Phigaleia and of the Parthenon, works of the same style and designed by the s same architect; the second was 2 1\6 times wider than the first, but was only 1 2\3 times higher.

Yet from statistics of the numerical relations observed between the elements of monumental Grecian elevations it results, that without comprising great differences, they were anything but fixed, and that their variations depend in a certain measure upon the relative diversity of Hellenic esthetics according to the place and the time.

Thus compared with the entirety of their contemporaries of Greece proper, the Doric edifices of the Hellas of Italy, and particularly those of Sicily, exhibit a tendency to develop vertical dimensions; this equally distinguishes in Greece the temples of the 4 th and 5 th centuries; but it is especially the productions of Ionicism -- those of Asia Minor more than those of Europe, however -- which it contrasts with those of Doricism. [1] It is marked by an actual increase in height of the platform, that sometimes accents the artifice of a shape adapted to facilitate the raising of the eye; sometimes it is a multiplication of the steps, which instead of the normal n number of three, has seven as at the Didymeion and at the Temple of Teos, ten as at the Artemesion of Ephesus, or even eleven as at the Temple of Apollo Smintheus in the Troad; sometimes it is a mode of superposing on the ordinary stepped substructure a plinth with sometimes very high edges, [2] (215,1), or of complicating the front steps by two projections cut off

at the level of the stylobate.[2] (215, 2).

Note 1. The ratio of the height of the facade (not including the pediment) to the width for the following temples is that of:--

Italy and Sicily.	
Paestum, Temple of Demeter	1 to 1.69
Agrigente, Temple of Concord	1 to 1.75
Segeste, Temple at	1 to 1.77
Selinonte, Temple C.	1 to 1.85
Agrigente, Olympeion	1 to 1.88
Paestum, Temple of Poseidon	1 to 1.90
Selinonte, Temple of Apollo	1 to 2.11
Greece proper.	
Cape Sunion, Temple at	1 to 1.61
Olympia, Metroon	1 to 1.73
Athens, Theseion	1 to 1.77
Epidauros, Tholos	1 to 1.77
Rhamnus, Temple of Nemesis	1 to 1.82
Egina, Temple of Aphaia	1 to 1.85
Phigalia, Temple of Apollo	1 to 1.86
Corinth, Temple of Apollo	1 to 1.89
Olympia, Temple of Zeus	1 to 1.93
Athens, Parthenon	1 to 2.25
Eleusis, Telesterion	1 to 3.45
Ionicism.	
Athens, Erechtheion (N. portico)	1 to 1.11
Athens, Temple of Athena Nike	1 to 1.34
Athens, Erechtheion (Caryatid portico)	1 to 1.70
Aizani, Temple at	1 to 1.80
Aphrodisias, Aphrodision	1 to 1.83
Didymeion	1 to 2.17

Note 2. See the Caryatid portico of the Erecttheion, "Monument of Nereids" at Xanthos, Mausoleum of Halicarnassos, the second Artemesioon of Ephesus, Monument of Lysicrates at Athens, and the Great Altar of Pergamus.

Note 3. See the Didymeion.

314 Of effects capable of impressing a moral, we only see for noting those of majesty and intended domination, the former by the composition of monumental entrances; the second by the

[illegible]

particle, not of the patterns of the soil with respect to [illegible] of the vesicle.

Yet Nelleson does not incline to, but except in [illegible] the even in the [illegible] [illegible] the practical construction of the outline in so far as the point of view and [illegible] the natural [illegible] conditions, and [illegible] to satisfying the [illegible] of the [illegible] of [illegible]

[illegible]

a rule of reference.

[illegible]ection of [illegible].

[illegible] is the necessary condition

[illegible]

of the angles. [illegible] of the surfaces and the [illegible]

[illegible] circles in the natural order by the [illegible] of the [illegible]. [illegible] (pages 29[illegible]) [illegible] than these blocks [illegible], so as to preserve from [illegible] of blocks the [illegible] section, [illegible] to [illegible] correct [illegible] of the materials. Let [illegible] the surfacing [illegible] until after the entire

[illegible]

arrangement of projections retarding admission, which constitute the elevation of the platform of the temple with regard to the ground, of the pronaos with reference to that of the peristyle, and of the pavement of the cell with regard to that of the vestibule.

Yet Hellenic architecture inclined to, and expert in charming the eyes by the picturesque appearance resulting from a
325 designed presentation of the edifice in accord with the point of view and with the natural monumental enclosure, and yet m more in satisfying the mind by the harmonious rythm of a balance of motives, such as were ordained by the designs of Halicarnassos, of the Altar of Pergamus, of Antioch etc.

III. Effects of Harmonic Order.

Nothing is more characteristic of Grecian architecture come to maturity, and which does it more honor, than its passion for effects of harmonic order, that produce the beauty of its lines, the correctness of its proportions, and the cadence of a rythm of relations.

Perfection of Form.

Perfection in execution, which is the necessary condition of all refinement in the matter of monumental relief, was never carried farther, than by the Greeks. In that respect, t their careful monuments of the best period are models of accuracy and of delicacy; the purity of the outlines, the freedom of the angles, the neatness of the surfaces and the accuracy of the jointing, afford to the eye and the mind satisfactions analagous to those produced in the musical order by the correctness of the sounds. We have stated (pages 289-291) w what minute precautions were taken, both to preserve from shock the delicate portions of blocks cut before setting, and to ensure a safe and correct placing of the materials. Let us add that the surfacing was delayed until after the entire completion of the construction, and was conscientiously executed by commencing at the top of the monument. [2]

Note 2. This does not mean that Grecian architects were s scrupulous in measuring. It was essential for the setting o out of their edifices to be perfect always; at Temple C of S Selinonte are measured differences of 7.9 ins. between two c consecutive intercolumniations, of 5.5 ins. between two adja-

adjacent triglyphs and metopes; the longer southern side of the Great Altar of Syracuse is 2.62 ft. longer than the Northern; the diameters of the columns of the Temple of Zeus at Olympia vary between 7.2 and 8.0 ft.; in an edifice as carefully execated as the Parthenon, the apex of the pediment does not correspond to the middle of the central intercolumniation, and there is neither equality in widths of metopes and of triglyphs, nor an exact correspondence of the triglyphs with the axes of the columns. The truth is that the Greekr were properly contented with the appearance of regularity.

Care for the purity of line is emphasized in edifices executed with particular care by artifices entirely significant, with a view of correcting the disturbing effects of certain optical illusions. Thus for the appearance of deflection presented by every horizontal line of considerable length, and which must affect the edge of the platform as well as that of the entablature; the architects of the Temple of Apollo at C Corinth, of Poseidon at Paestum, of the Parthenon, of the Propyleion and of the Theseion, counteracted this by imparting to the lines mentioned a vertical curvature upward. [1] Thus again for the illusion of a reduction at mid-height, which a affects the view of a prism or a cylinder; this was remedied by a curvature of the antes and columns, i.e., by giving them a slight curve, according to a hyperbolic or parabolic profile, that was at first quite marked and then scarcely perceptible. [2] (217). They took care to counteract by a slight increase in diameter the apparent reduction of the angle columns, by the effect of light, which at a certain position of the observer "washes and consumes" them, -- these are the words of Vitruvius. Another precaution was to slightly incline forward the face of the Ionic entablature, which was lower than t the Doric (page 303), and that risked the appearance of slanting backward, [3] as Vitruvius again says. (201, 1).

Note 1. At the Parthenon the convexity forms an elliptical curve, pronounced at its ends, whose rise at one end measures 2 9\16 ins. for a length of 98.5 ft., and at a sode is 4 7\8 ins. for 209.0 ft.

At the Temple of Paestum, the rise at the facade is 13\16 in. for a distance of 78.7 ft., and 1 9\16 ins. for 97.0 ft.

at the side; at the Propyleion it is 1 9\16 ins. for a base of 78.7 ft.

Note 2. The proportion of this curvature, termed entasis by the Greeks, was variable. For some Athenian buildings are given its ratio to the height of the shaft.

Olympeion, 1 to 382. -- Parthenon, 1 to 552. -- Erechtheion, 1 to 1080. -- Propyleion, 1 to 400. -- Theseion, 1 to 708.

The shafts of the columns of the Didymeion are cylindrical for the lower third of their height; the seventh drum is a t truncated cone, and the eleven others are also truncated conically, but in a lesser proportion. (217, 3).

Note 3. Indeed an inscription engraved on the ante of the Temple of Priene attests, that the Greeks knew how to calculate the increase of height necessary, so that the apparent r reduction of dimensions in proportion to its height from the ground should be compensated.

The Logic of the Forms.

All the elements of a Grecian mounmental arrangement conspired in the production of a powerful effect of harmony; for on the one hand, the forms of the members were rigorously determined by the general structure of the edifice and by the proper function of each one; on the other, a strict discipline ensured their reciprocal dependence and the subordination of the detail to the whole.

The secondary relief of the Grecian edifice had as its dominating character, that of being profoundly rational, like a all other elements of Hellenic architecture; on such grounds, that it is possible to take account of its various diversities, that are regarded as functions of stone construction, or that are regarded as proposed, to an ariginal arrangement of carpentry, translated into stone. (Page 314).

Not that it was structural. It -- which is observed only in the classical epoch and on the most carefully executed buildings -- there is an accord of the masonry and of the form, the latter has demanded this; there is no better evidence of this than the structure of the Doric frieze; (page 305; 203,2) the metopes there being only independent of the triglyphs, w when they comprise a sculptured decoration, which it is best to execute before setting; indeed when the material was not

marble, the masonry was masked by a coating. What we have j just said in regard to the relief of stone is equally true f for that of wood; for carpenters and joiners demand the effect of relief, not carved out of the mass, but by overlays of boards, bands, and mouldings.

In other qualities resides the logic of forms, that the Greeks imposed on an architectural member; in their adaptation to its organic function, in their accommodation to its relat-
327 ive situation on the elevation, and to the degree of its lighting; also in a wise application of the principle of least e effort, i.e., in the choice of profiles, whose agreement with those easily realized by the work of the quarrymen and of the stonecutters reduces to the minimum the operations of cutting and setting.

Relations and Proportions.

It is on reason as much as on sentiment, and even in a very large measure on the use of systems, and up to a certain point -- at least to the decline of Hellenic art -- on the application of formulas, that depends the proportioning of the dimensions of an architectural member, and of the different parts of a whole.

And at first -- at least concerning the temples -- the rhythm was abstract, for it was not the stature of man that gave the key; the steps of the substructure did not have their heights fixed by the normal magnitude of the elevating movement of the foot, no more than the height of a doorway was in relation to the human height. A monumental Grecian arrangement was not on the scale of any reality outside itself; it consisted in a sort of mathematical scale, whose initial note was chosen by the architect.

It was frequently regulated by a harmonic system, relating each dimension of a monument to the same measure, which made of it a multiple or exact submultiple of that standard, so t that all the elements, heights, widths, solids, voids, projections and recessions -- were "symmetrical", to speak as the Greeks, and commensurable, to employ our vocabulary. The measure termed "module" was sometimes a principal dimension -- the length of a facade, sometimes a secondary one -- the height of an isolated support, sometimes one of a detail -- the

diameter of a column or the width of a triglyph. Thus the f facade of the Arsenal of the Piraeus was proportioned with r respect to its width; its height to the apex of its cornice was the half of that dimension; that of the lintel of the do-orway equaled two thirds of the half of the basal dimension, while its length was precisely equal to that half, etc.

Practically, that harmonic scale is confounded with a scale of measures, [1] by reason of the precaution taken by the Gree-ks to figure all dimensions, particularly the initial ones, in an entire number of feet, of inches, of palms or of finge-rs, [2] free to change fractions into round numbers. [3].

Note 1. The facade of the Temple of Poseidon at Paestum o offers a typical example of the combination of the two syste-ms. (219,1). On the one hand, if the width of the platform be divided into 12 equal parts, it is found that the first a and last determine the position of the axes of the entrance columns, and the others, when grouped in pairs, the axes of the other columns, their height etc. The width between the axes of the extreme columns being taken as an initial measure, there is obtained with 1\5 its measure the average intercolum-niation and the entablature, including the gutter; with 2\5 of it, the height of the columns, and with 3\20, the rise of the pediment; with 1\25, the average half diameter and the h height of the capital; with 3\25, the length of its abacus; with 1\15, the depth of the architrave, of the frieze and of the cornice. On the other hand, all the large figures are w whole numbers of Italian feet equal to a standard dimension; the intercolumniation, mean half diameter of the column, or to its exact multiples.

Note 2. The value of the foot, divided into inches and pa-lms, varied according to the place and the time. The Olympi-an foot was 1.051 ft.; the primitive foot of Athens was 1.079 ft.; that of Magna Grecia was 0.97 ft, and that of Miletus a and of Priene was 0.97 ft.

Note 3. The Greeks sought for square numbers, the "powers". Thus the sums of the feet expressing the height of the facade of the Arsenal of Piraeus, that of its side facades and the width of the doorway, repeatedly express the square of 6, the cube and square of 3.

The arithmetical modulary system of putting into proportion was in competition, and sometimes in the same arrangement with the graphical method of a geometrical construction, for w which served as basis an initial line of the drawing. Sometimes the figure was a triangle, either equilateral, or right= angled of the egyptian type with sides in proportion to the numbers 3, 4 and 5; or isosceles, with height to base as 2 1/2 to 4; sometimes the figure was a square or a rectangle. The sketches in Fig. 219 indicate the method and utility of the operations.

This research for monumental harmony by rational ways and by scientific methods closely connected the esthetics of the architecture of the Greeks to that of their statuary, which made the beauty of a statue depend upon the "harmony of the members"and on the "accord of most of the numbers"; in a more general way, it perfectly accorded with the logical turn of Hellenic genius, and with the taste of the Greeks for mathematical speculations.

311. That led directly to the formula, to the canon as the Greeks said. Indeed, there were architectural canons, as there were those for statuary, and from the beginning of the 4 th century, the masters of the art of building were pleased to state in treatises on the theoretical systems of proportions.

312. The passage from the formula to the recipe was fatal; it w was accomplished by the Hellenistic art at the decline of the Pagan epoch, and Vitruvius gives us an idea of its results.[1] But it was necessary at even that epoch for the Grecian architect to proceed as an engineer. From the canon he demanded only a general lay-out, and it was only by approximation, that he determined the definitive outlines, in taking into account particular requirements and especially the demands of t the eye.[2] For these amendments the Hellenistic epoch aided itself by formulas. Thus to determine the height of the columns, that necessarily should be proportioned to their spacing, it did not employ the general canon, that fixed the desired magnitude at the value of 10 modules, of 9 1/2, 9, 8 1/2 or 8, according to whether the intercolumniation was "minimum", "narrow","proper", "wide" or "extreme".

Note 1. For example, here is a practical method for arran-

arranging the facade of a Doric temple with six columns; divide the width into 42 parts, one of which will serve for the module, taken once, this gives the half diameter of the column; its height is 14 times; if the programme comprises but 4 columns, take for the module 1\27 of the width etc.

Note 2. Thus, resuming the previously utilized facade of the Temple of Poseidon at Paestum, it is evident that the actual distances between axes of the columns do not accord strictly with the theoretical, which equals 15 ft; the two extreme intercolumniations measure 15 ft. less 3 ins., and the o others are 15 ft. plus 2 ins. Being forced by reasons of appearance, which we shall explain later (page 344), to reduce the last intercolumniations, the architect did not fail to m make flexible the theoretical rigidity of the modulary system.

In truth, so that it was harmonious by measure or canon, t the putting into systematic proportion was never, in the eyes of the Greeks, an absolute method susceptible of mechanical application, but rather a practical means for reducing attempts by reference to a pattern, whose method of establishment guaranteed an average accuracy; on the whole it favored the research for harmony, in the same fashion that the ruling of squared paper ficilitates the outlining of a plan. That is so true, that even a poor formulist like Vitruvius does not fail to specify, that "the symmetries being well established and the measures accorately taken, this will make proof of t talent as well as to know, according to the nature of the location, what custom and beauty demand, to omit or to add --- to introduce all necessary modifications". [4]

Note 3. The technical nomenclature was:-- Pycnostyle, intercolumniation equal to 1 1\2 modules; systyle, interculumniation 2 modules; eustyle, 2 1\4 modules; diastyle, 3 modules; aerostyle, 4 modules.

Note 4. De Architectura. VI. II, I.

[illegible] The Orders.

[illegible] as [illegible]
[illegible], [illegible] strictly restrained by the [illegible], [illegible] the [illegible] of one of the usual formulas [illegible]

[illegible], their [illegible] forms and their [illegible] classes, [illegible] "Orders".

[illegible] was [illegible] discussion [illegible] the [illegible] of the [illegible] more [illegible] for the [illegible].

[illegible] of the principal was the [illegible]

With [illegible] and [illegible] two stories, the Greeks [illegible] two [illegible] of [illegible] supports separated by an entablature. ([illegible]). Most frequently the two [illegible] were [illegible] in the same mode. When this was the [illegible]

[illegible] did not object to [illegible] in the same [illegible], [illegible] to group in a series supports of different orders. [illegible] for example, in [illegible] of [illegible] Doric [illegible]

[illegible], where the [illegible] of the hall of the [illegible], [illegible] of the aisle in the rear of the front portico; [illegible] of the [illegible] of Pergamon, a Corinthian column [illegible] Ionic, [illegible] Doric executed on the portico; [illegible] of the temple of Athena at Pergamus, the [illegible] and that of the [illegible] story was [illegible].

1. The Doric Style.

In the judgment of the artist like the historian, the composition of the Doric style was the most remarkable work of Grecian architecture; more original than its rival Ionic, more expressive than that of the Hellenic temperament, it is also more [illegible] architectural. Deriving its entire [illegible] from a [illegible] of the functions, with a [illegible] and [illegible] composition of the [illegible]

353 Chapter 6. The Effect.

II. Effects of Secondary Relief. The Orders.

The secondary relief of a Grecian edifice, as we have already noted, found itself strictly determined by the choice, t that the architect made of one of the usual formulas for the elevation; for each was indeed equally calculated the number of elements, their general forms and their respective places, hence their name of "Orders".

They were two, the Doric and the Ionic. The adoption of t
354 the former was subject to a rigorous discipline; the application of the second comprised some liberties for the details.

Besides these general modes of arrangement existed some particular types of elements, of which the principal was the Corinthian, Particularly to construct the interiors of temples with several aisles and porticos in two stories, the Greeks readily superposed two tiers of isolated supports separated by an entablature.(167; 181; 200). Most frequently the two tiers were designed in the same mode. When this was the Doric, the upper columns were so shaped that their outlines prolonged those of the lower tier.

Yet Hellenic architecture did not object to associate in t the same monument, even to group in a series supports of different orders. Thus for example, in edifices of the Doric s style like the Parthenon and the Propyleion, Ionic columns s supported there the ceiling of the hall of the maiden goddess, here that of the aisle in the rear of the front portico; in the interior of the Temple of Phigalia, a Corinthian column was near the Ionic, while the Doric extended on the portico; at the porticos enclosing the Temple of Athena at Pergamus, the upper gallery was Ionic and that of the ground story was Doric.

I. The Doric Style.

In the judgement of the artist like the historian, the composition of the Doric style was the most remarkable work of Grecian architecture; more original than its rival Ionic, more expressive than that of the Hellenic temperament, it is a also more thoroughly architectural. Deriving its entire effects from a frank manifestation of the functions, with a rational and harmonious composition of the parts and a refined

formation of the elements, it satisfied the eyes and delighted the mind. Considered in the average of its applications, it responds to an ideal of force and of dignity, which at least until the end of the classical epoch, comprised the risks of heaviness and coldness; a chronological classification of its works reveals besides a remarkable permanence of its essential traits, a succession of variations, which attest an incessant effort toward the better, a regular advance and a marked evolution in the sense of elegance.

335 The Substructure.

The part given to the stylobate in the greatest number of the superior edifices of the style in the classical period -- we will name the Temple of Poseidon at Paestum, the Temple of Zeus at Olympia, the Parthenon and the Temple of Phigalia -- vary between the ninth and the eleventh of the total height exclusive of the pediment, the general subdivision being into three steps. A considerably greater height characterizes, on the one hand, several temples in Sicily, notably those of Selinonte designated by the letters C, D and R, and on the other, some edifices of the 4 th century -- such as the Asclepion of Epidauros.

As for the forms of the steps, this comprises many variants. Sometimes, as at Nemea, they were all of the same height; more frequently they were unequal, the upper ones being highest. Sometimes, as at the Parthenon, their width was a minimum; s sometimes, as at the Temple of Poseidon at Paestum, it approached the vertical dimension, but rarely exceeded it. Finally the riser was sometimes plane, sometimes recessed more or less at the bottom, with a simple or compound moulding at the recess.

The Wall.

The normal relief of a Doric wall was reduced to a small n number of movements, very little accented and of the simplest profile, confined to the base and top of the elevation. On the one hand -- thus at the Parthenon -- were the very slight offsets of the courses of the plinth and of the orthostate, (221,4; 195,7), and on the other -- for example the Temple of Zeus at Olympia -- the small projection of a simple moulding, profiled it is true, as a bird's beak in a manner to properly

separate the upper border from the wall by a strip of shadow. (222,1). The Doric style always admitted some complications and a little variation, notably at Athens, where it was influenced by its rival; such as the arrangement of a rudimentary cornice by the placing of a very slightly projecting band beneath the terminal moulding -- this solution may be observed at Egina (222,2) -- or a band supported by a moulding in the manner of that shown by the Parthenon (221,3); such again was an ogee in the profile of the plinth, an example of which is offered by the Theseion (221,5). It might occur, as proved by the Treasury of Sicyon at Olympia, that the wall was orna-
356 mented over its upper part by a frieze of triglyphs and metopes, or as at the Parthenon by a sculptured band (221,6), or that its surface was broken by a series of engaged columns, as the case at the Olympeion of Agrigente.

The Doric solutions of the problem of the formation of the top of the wall manifest an evolution in taste. At first was an inclination to relate the appearance of the antes to that of the columns adjoining them; indeed the Temple D of Selinonte, the Temple of Apollo (G.T.) in the same city and the "Basilica"of Paestum exhibit the application of a system of termination by the penetration of the wall into a member in the form of an isolated support, a column in the first case, and in the two others a square pier crowned by a capital, more or less developed.(222,2,3). The epoch of attempts closed, the modeling of the antes was strictly allied to that of the wall; scarcely did this project beyond its face and not always on its two surfaces; its corners corresponded to those of the wall, and it was inclined like that; it even had the same base and cap, excepting that the latter was frequently a little more accented and labored.(222).

357 As for the doorways, the simplicity of their enclosure was scarcely relieved by a modest moulding recessed in bands.

The Facade with Portico.

The proportioning of the different magnitudes combined in the arrangement of a facade with portico -- respective heights of the colonnade and of the entablature, the solids of the supports and the voids of the intervals, the vertical and horizontal dimensions of the shafts -- is conditioned by a lim-

limitation and by a liberty; limitation by the impossibility of exaggerating the span of a stone beam; the power for the same entire elevation, of increasing or reducing the part of the colonnade, and by reason of the excellence of the construction, of largely reducing the isolated support. It was again influenced by the progress of the taste for slenderness, manifested by all the schools of architecture.

The Colonnade. -- Compared woth regard to stature, the existing Doric columns are classed in three categories:-- the stumpy, whose height measures less than five times their diameter at the base, and of which no specimens exist later than the middle of the 5 th century. [1] (223,S,C); the medium, into the height of which the diameter at the base goes between 5 1/3 and 6 times, [2] and which are generally contemporaneous w with the second half of the 5 th century (223,P); finally, t the slender, whose altitude is equivalent to at least 6 to 7 diameters, the fashion of which was commenced by the 4 th century. [3] (223,N).

Note 1. Artemesion of Syracuse; Temple of Corinth; Temples of Poseidon and of Demeter at Paestum; Basilica at Paestum; Temples C, D and of Apollo at Selinonte; Temple of Zeus at O Olympia.

Note 2. Temple of Apollo at Phigalia; Parthenon, Theseion and Propyleion at Athens; Temples of Aphaia at Egina, of Athena at Tegea, and of Poseidon at Sunion.

Note 3. Temples of Nemea, of Athena Polias and of Dionysos at Pergamos.

An advance with the same tendency and nearly contemporary developed the colonnade at the expense of the entablature to the point at which for the total height, the latter received from the architecture of the 4 th century only 5/12 of the p part assigned to it by that of the 6 th. [4] (223).

Note 4. When at the Temple of Corinth (6 th century), the percentage of the colonnade is 63, it increases a little later to a little more than 66 at the Temple of Poseidon at Paestum, to 73 at the Temple of Olympia, to nearly 77 at the Parthenon, to 78 at the Metroon of Olympia, and to nearly 80 at the Temple of Nemea.

On the contrary, omitting some archaic edifices -- such as

338 the Heraon of Olympia -- where the use of wooden architraves permitted wider spacing of the supports -- and others -- such as the so-called Temple of Artemis at Syracuse (223,() -- where the timidity of a stone construction at its beginning exaggerated their proximity, the ratio of the voids to the solids of the colonnade was entirely stable, -- the Greeks having reduced the intervals as they diminished the diameters. [1]

Note 1. The most frequent ratios between the measures of the diameters and of the intervals are these:-- 1 to 1 1\7, (Temples of Corinth and of Poseidon at Paestum); 1 to 1 1\4, (Temples of Segeste, of Concord at Agrigente and the Parthenon); 1 to 1 1\2, (Temple of Apollo at Selinonte, the later p-part; Temple of phigalia and Asklepion of Epidauros); 1 to 1 2\3, (Theseion, Temple of Egina, Temple D of Selinonte); 1 to 1 3\4, adopted for the Temple of Zeus at Olympia, is exceptional; the same for 1 to 2 1\3, chosen for the central passage of the propyleion of Athens. (224).

For a diameter of 100, the voids are :--

70, Temple of Artemis at Syracuse.

115, Temples of Corinth, of poseidon at Paestum.

124, Propyleion of Athens, average intervals.

127, Parthenon, Temple of Nemea.

150, Temple G at Selinonte, later portion.

161, Theseion at Athens.

175, Temple of Zeus, Olympia.

185, Heraion, Olympia.

239, Propyleion of Athens, middle interval.

339 A comparison of the intercolumniations of the same portico reveals inequalities already mentioned (page 325, note 2); w without speaking of those that may be imputed to eerors of l location, or to the desire of dinoting by a greater width of passage corresponding to the entrance to the edifice, as premeditated, and for which we shall give a reason a little later. [2] (Page 344).

Note 2. Here are some examples of facades (the measures b being taken between the axes of the columns. (Metres ?).

Temple C at Selinonte, 4.25-4.46-4.54-4.46-4.25.

Parthenon, 3.71-4.26-4.32-4.32-4.32-4.26-3.71.

The Column. -- With very rare exceptions, almost all contem-

contemporary with the Hellenistic epoch and imputable to artists, who were accustomed to the appearance of the Ionic order and had no longer any sentiment for the construction of i its rival, the Doric column never comprises a base.[3]

Note 3. The arrangement, otherwise exceptional in all respects, of the Olympeion of Agrigente, comprised the continuation on the shafts of engaged columns, of the moulding extending on the wall. As an example of the Hellenistic epoch may be cited the columns of the Temple of Dionysos at Pergamus.

The ratio of the height of the capital to that of the shaft suffers variations concomitant to those already noted with regard to the ratio of the colonnade to the entablature, and l
34. like that, determined by a tendency to reduce more and more the role of the upper parts; when the 6 th century assigned to the capital at least 1/8 of the total altitude of the support, the 5 th gave it only 1/12, and the 4 th accorded to it no more than 1/27.[1] (224).

Note 1. Here are some ratios of the height of the capital to that of the column.

Corinth	1 to 7.80
Selinonte, C	1 to 8.20
Segeste	1 to 9.49
Theseion	1 to 11.25
Parthenon	1 to 12.12
Nemea	1 to 27.38
Pergamus, Temple of Dionysos	1 to 30.00

By so doing, architecture yielded to a general movement, w which led contemporaneous sculpture to diminish the part of the head in the representation of a man.

It is the same for the diminution of the shaft; the inclination of the outline from the vertical varies per ft. in height from 0.55 to 0.24 inch, according to whether the example precedes the 5 th century or not.

The shaft was channeled by flutes, whose number was usually 20; sometimes and especially in the primitive epoch, 16; rarely 12, 18, 24 or 28. The profile of their section was calculated to accent the contrast of the lights and shades, opposing to the sharp edges ellepitcal curves, relatively deep and sometimes rounded at their ends.(226,3). The refinement in

relief forming the flutes tended to two ends; at the same time that it gave body to the column, which if plain would have lacked the brilliant lighting, it energetically emphasized its function as support by multiplying the indications of verticality. Eager for novelty, the Hellenistic epoch sometimes imagined the replacing of the flutes by flat sides -- the square portico and the houses of Delos present examples contemporaneous with the 2 nd century, either as at delos or at the Temple of Athena Polias at Pergamus, confining these to the two ends of the shaft, an appearance which would have caused in the Greeks of the 6 th and 5 th centuries the idea of an unfinished facing, and that gives to us that of a normal support, partly masked by a case.

The capital was well shaped in view of the manifestation of its twofold role of a structural intermediate concentrating t the load of the architrave on the head of the shaft, and of an intermediate sculpture forming the transition from the plane and angular appearance of the former of these members to the roundness of the latter. Indeed it was composed of an upper element, a square slab termed an abacus, and a lower part named the echinus, primitively fashioned with a curved edge, as may be seen figured on painted vases, later as a truncated conical cushion, more or less expanded. Moved by the desire, t that we shall certainly observe in this portion of our study, to make evident the function of an organ, the Greeks endeavored to free the profile of the capital from the confusion in appearance, threatened by its position in a shadow. Resuming the principle first applied in the flutes, they thought to distinguish the echinus from the shaft by masking the end of the former and the beginning of the latter by means of a collar of horizontal grooves termed annulets (226;2,4-6; 225; 227); besides that the primitive school, particularly in Italy and Sicily, voluntarily had recourse to a reduction at the top of the trunk, known under the name of gorge, and that the classical epoch rejected.(226,1; 227,1,2).

The profile of the Doric capital varies according to the epochs, affected by an evolution parallel to that noted in regard to the entire column, and in the same direction. Under its primitive form, it projected excessively beyond the shaft as

well as the architrave, the slope of the echinus with reference to the plane of the top of the trunk never exceeding 30°; from the beginning of the 6 th century, its projection was sensibly reduced; in the first half of the 5 th century -- as proved by the order of the Temple of Poseidon at Paestum or that of the Temple of Zeus at Olympia -- the inclination of the echinus already increased to 40°; the Attic school of the great epoch opened the angle to about 45°, and the Hellenistic epoch carried it to 50° or 55°. The horizontal dimensions of the abacus having always been controlled by those of the echinus, w which it scarcely exceeded, the innovations just described progressively reduced -- to the great benefit of the effect -- t the projection of the slab before the architrave. The change must become more apparent, since the face of the entablature, at first vertically over the top of the trunk, was set forward of it from the beginning of the 5 th century.(227,A-D). Modified at the same time and influenced by the same movement were the curve of the echinus and the thickness of the abacus; the former being at first a little loose and even ineffective, became more prominent, while the second, after having been a little higher than the cushion, from the 5 th century no longer equalled more than 5/6 or even 5/7 of its height. (227,1-6).

The Entablature. -- The arrangement of the Doric entablature was nothing more than a smaller repetition of the general theme of the order, with some variations; to the three parts of the latter corresponded the three zones that it superposed; t the architrave to the stylobate, the frieze to the colonnade, and the cornice to the entablature. (222).

The slight projection of a narrow band, doubled vertically beneath each triglyph, distinguished the individuality of the architrave in the entirety of the entablature.

By the simplicity and the freedom of its prismatic form with plane faces and straight edges, this member was endowed with a character of robustness and severity, appropriate to the nature and function of its work. At first equal to the frieze, at its expense was accomplished after the 5 th century the diminution of the height of the entablature, that we have already mentioned. That resulted in an excess, which reduced the appearance of stability implied by the capital importance of this

beam, and constituted an infraction of the law of harmony regulating Hellenic architecture.

Real or imitative, as its function was or was not structural,[1] the frieze developed a facade of a blind portico, by the alternation of piers -- of triglyphs and niches -- the metopes. I Indeed the relief of the former aroused the idea of isolated supports; their faces were grooved by vertical "channels", the exact equivalents of the flutes of columns, and their tops presented a projecting band, that recalled so much the more the abacus of the capital, because by a partial chamfering of the angles of the block, its upper corners overhang.(203,2; 225; 258). Like all the elements of the Doric order, the triglyphs gained in slenderness in the measure, that Grecian architecture advanced from its beginnings; at first being nearly cubical, they were twice as high as wide in the classical epoch.

Note 1. See below; Chapter 4, pages 328, 305; Fig. 203,2.

The arrangement of the frieze presented a difficult problem. By reason of their appearance as isolated supports, the triglyphs had their places indicated; at first vertically over each column and at the end of each facade, to represent the support of the angle of the cornice, and then in the middle of the length of the architraves. Now the angle triglyph being necessarily outside the axis of the last column, the last metope must be wider than the others (228,A,B). Ungraceful in itself, this elongation would have introduced a shocking discord into t the harmony of the frieze.

The Greeks got out of the affair by the artifice of a contraction of the last intercolumniation, even as observed on the Temple of Poseidon at Paestum, by the reduction of the two last, which better accommodated passage. For a long time was a harmonizing of the opposed requirements of the colonnade and of the frieze; sometimes the reduction of the two last intercolumniations was not what it should have been -- thus at the Temple mentioned at Paestum, the contraction was not one half that required by the theory (0.59 instead of 1.28 ft.); sometimes as at the Temple of Segeste, they cheated in the relation of the triglyphs to the columns.(228,C). More strict, the classical school reduced the last intercolumniation as much as necessary to ensure both equality of metopes and correspondence

of the axes.(228,D).

If it concerns a frieze under a portico, the difficulty is complicated by the fact, that the architect could not effect at the same time the concord of the triglyphs with the columns and that of the ceiling beams with the triglyphs. The archaic epoch sacrificed the first to the second (228,A); the 5 th century proceeded inversely (228,B). There was only one means of avoiding the appearance of discord, disagreeable to the eye and painful to the mind, assumed by the triglyphs or beams, a-according to the case; this was to suppress the former. It w was employed at the Parthenon with a certain reserve, that marks the illogical retaining below the frieze of the regula and drops placed under the triglyph (228, II,C); on the contrary, the application of the remedy was radical at the Theseion. (228,II,D).

These difficulties repulsed the architects of the Hellenistic epoch, who diverted elsewhere from the Doric order their t taste for a graceful and picturesque effects. They proscribed it on the pretext, that its proportions were "false and untruthful".[1]

Note 1. Mendosa et disconvenientes. Vitruvius. IV,III,1.

The cornice reveals the same phenomenon of progressive diminution in the course of centuries manifested by all the upper parts of the Doric order; in the 6 th century, its height equaled 2/3 that of the frieze; in the 5 th, it scarcely equaled 2/5 of it, and in the 4 th, it practically attained just 1/3. Altogether its relief was structural, conformed to the necessity of carrying rain water away from the facades.(199; 201; 225).

The care for effect always introduced some complications; t thus to detach on the sky the outline of the edifice, they employed on the upper zone or cyma a wavy profile, very well suited to impress the eye by the contrasts of light and shade p produced by it, and to which the Greeks had applied the expressive name of a "little space"(cymation). Thus again, with t the view of both diversifying the shaded vertical face of the cornice,and of recalling the rhythm of alternating solids and voids, which characterizes the colonnade and the frieze, they carved on this "soffit" above each triglyph and the middle of each metope, a tablet termed mutule, decorated by 18 cylindri-

[illegible]

[illegible] the ... [illegible] all the rest... [illegible] and ... by an arrangement of masses and ... [illegible] of the ... cap.(Vit.I,2,3).

With the ... the rhythm of solids and voids, of vertical and horizontals, of curves and straight lines, of ... surfaces, of lights and shadows, whose proc... [illegible]

III. The Ionic style.

[illegible]

[illegible] is followed by a much more slender stature, which ... to ... and ... (Vit. ...). Rather ... not ... in the same sense, but conceived in the s... the Ionic or ... flexible and ... to ... variety, it ... by the ... of a ... [illegible]

[illegible]

... in its ... to that of ... [illegible]

[illegible]

... (...): ... of ... of ... [illegible]

[illegible]

... the same ... that ... [illegible]

... of ... [illegible]

[illegible]

cylindrical or conical projections called drops.

Faithful to the principle of propriety, the Greeks suppressed in the cornices beneath a portico all the useful forms, and replaced them by an arrangement of gorges and projections appropriate to the role of a cap.(221,1,2,3).

Such was the wise rhythm of solids and voids, of verticals and horizontals, of curves and straight lines, of planes and rounded surfaces, of lights and shadows, whose production doubtless forms the principal title to glory for Hellenic architecture.

III. The Ionic Style.

Compared to the Doric, the Ionic order manifests another esthetic ideal.

First it differs by a much more slender **stature**, with a tendency to thinness and even to dryness.(230). Further its forms are not modeled in the same taste, nor conceived in the same spirit; it was fond of curvatures, flexures and transitions; although it constituted an organic entirety, it aimed to charm the eye by the advantage of a picturesque relief or of a brilliant ornamentation, as much if not more, than to satisfy the mind by the exhibition of the construction, the expression of the function, or the harmony of the proportions. Finally, if for the general orientation and the chronology of the great s stages, its evolution is analagous to that of its rival, for energy and charm, it is clearly distinguished. Like the Doric, the Ionic regularly increased in slenderness, particularly from the 6 th century, until it attained an excessive garcefulness (233); like it, it had its epochs of infancy, of youth and of maturity, respectively contemporaneous with the 7 th century, the 6 th, and the second half of the 5 th. But besides t that its old age was singularly longer and more green, its development, considered in its entirety and in each of its periods, does not reveal to the same degree that unity, that certainty, nor that refinement in perfection, which recommends its rival; on the contrary it comprises a quite considerable portion of wanderings and of innovations.

The Wall.

In a general way, what we have said of the relief of the wall in the Doric style is true for the corresponding element of

an edifice of the Ionic or Corinthian style, with the reservation of the secondary differences, that from the 4 th century constitute a multiplication of movements and a variation of p profiles. The incidents of the modeling consist in hollows as well as projections. There were sunken drafts bordering the joints of the masonry, as on the Choragic Monument of Lysicrates (190); niches enclosed by cornices and columns, like those observed at the portico of Athene Polias at Pergamus and at t the peribolus of the Aphrodision of Aphrodisias; pilasters, examples of which are offered by the Bidymeion, and the propyleion of the Temple of Athena at Priene (232), and of engaged c columns, such as those presented by the Philippeion of Olympia or the Choragic Monument of Lysicrates.(190).

Richly defined by architraves with numerous reveals, surmounted by caps supported by consoles, doorways like that of the northern facade of the Erechtheion, almost suffice for the ornamentation of a great area of the wall.(262). Although more simple, the enclosure of the windows with its detailed mouldings and the ears making the ends of the lintel, also constitute a very appreciable enhancement.

317 The profile of the plinth had for its essential element the motive of the torus grooved by horizontal fluets (231,2); that of the cornice was a prolonged undulation interrupted by astragals.(231,1,3). The ante showed a tendency to make its appearance approximate that of the capital; that was accented in t the 4 th century by the projection -- observed on the Temple of Tegea and on the Didymeion -- of diminutives of volutes on the sides of the capital.(231,4; 232).

The Facade with Portico.

Statistics of the numbers that represent the ratio of the h height of the column to the lower diameter of the shaft, and that of the colonnade to the entablature, furnish both a proof of the essential character of the tendency of the Ionic order to become more slender, and an accurate measure of its progress in this sense in the course of its history.(233).

From the 6 th century -- witness the Heraon of Samos -- columns were erected, whose altitude amounted to 7 1/4 diameters; and from the second half of the following century, one of 9 to 10 diameters was the rule. [1]

Note 1.

Samos	7.26 diameters.
Athena Nike	7.70
Erechtheion, portico	9.06
Erechtheion, N. portico	9.26
Didymeion	9.80
Aizani	9.89
Propyleion	9.94
Phigalia	9.94

It is proper to observe, that for the two last types, the d dangers to the isolated support were reduced by the location of the first beneath the portico, and by that of the second at the tops of the projections.

Likewise for the part of the colonnade in the entire elevat-
350 ion of a facade; within the limits of our information, we note that it varies from 75 to 84 per cent, the first of these being furnished by the Temple of Athena Nike at Athens, and the second by that of Apollo at Didyma.[1] (233).

Note 1. Athena Nike, 75 per cent; -- Erechtheion, north, 79 per cent; Aezani, 81 per cent, Didymeion, 84 per cent.

In the Ionic order as in the Doric, making the supports more slender introduced a proportional reduction of their intervals. On the contrary, their spacing was regular.

The Column. -- Because of the slenderness of its shaft and the smallness of its section, the Ionic column could not do without a base, which distributed the load transmitted by the support over a sufficient extent of the bearing area. This i inserted members, like its Assyrian and Hittite prototypes (pages 145, 157), and presents the appearance of a pile of disks, whose height varies in the specimens from 1/14 to 1/25 of the total height of the column.[2]

Note 2.

Athena Nike	1\14
Aezani	1\15
Heraon of Samos	1\17 to 1\18.
Propyleion	1\23
Erechtheion, east	1\24 to 1\25.

It invariably projected beyond the shaft; but in regard to the shape, it comprised four varieties; a first, whose known
351 examples belong to Asia Minor (Heraon of Samos, Temple of Ath-
352 ena at Priene and the Didymeion), more or less equivalent to

a cylinder (234,3-6; 238; 239); a second, whose formula was a applied with moderation by the Attic school of the 5 th century, and with a certain exaggeration by the architecture of the 4 th century, inscribed within a truncated cone more or less hollowed (234,7-10; 229; 236; 248); a third, which obtained t the favor of the Hellenistic epoch, accented the characteristic of the type by interposing between the proper base and the ground a slab termed plinth, generally square, sometimes polygonal or circular as at the Didymeion.(233, 11-14; 235); fina-
372 lly a fourth, specimens of which are very rare -- we can cite only those of the Temple of Naucratis and of the Artemeseon of Ephesus -- superposed two bases, the lower being of the ordin-
374 ary type, the second in the form of a high drum, cylindrical or truncated conical.(234,4,5). From the point of view of the secondary relief of their mass may be distinguished three sorts of bases; that whose profile only comprises a restricted n number of movements, and whose dominant element is an ample c curve, alternately convex (torus) and concave (cavetto) --- it possessed the favor of Attica in the 5 th century (234,5-10); that preferred by Ionia in the 4 th century as well as in the 6 th, and which multiplied the elements (234,3-6); that preferred by Greece proper in the 4 th century, which reduces the p part of the torus and comprises angular recesses and largely open hollows.(234, 11-14).

Like the Doric, the Ionic shaft is diminished and with an e entasis, but is much smaller in proportions, [1] so much the less to the eye, since at the two ends it slightly expands in a curve termed apophyge, whose useful function is to enlarge the bearing area and the supported area of the trunk, with the esthetic role of arranging a transition to the base and the capital.

Note 1. Diminution of shafts:--

Samos	0.0128 inch per ft.
Athena Nike	0.0064
Didymeion	0.0064
Erechtheion	0.0052
Propyleion	0.0049
Aezani	0.0027

Primitively plain, as indicated by the fragment discovered

at Napea and the remains of the Heraon of Samos, the Ionic shaft was early fluted like the Doric, but with differences expplained by its more slender stature and its more graceful form; more numerous flutes -- especially at the beginning [2]-- and t therefore narrower; edges at first sharp but with fillets from the 6 th century; section of the curved flute either semicircular or oval.(237).

Note 2. There are counted 40 at the Temple of Ephesus, 44 on the Column of Naxos at Delphi; 24 was the rule in the 5 th century and 20 in the 4 th.

The form treatment of the Ionic capital was adapted to its function, as it satisfied all requirements for effect; for at the same time that the development of its mass is realized or simulated -- according to whether it was loaded on its entire surface (239,9,17), or whether the insertion of a central slab relieved its ends (238) -- a useful relief for the architrave, its model arranged a happy transition between the planes and angles of the entablature on the one hand, and on the other t the round form of the shaft. Indeed, its finished type associated two parts of plane and angular appearance with two of c curved appearance.

On an echinus of spheroidal form is placed a slab, whose plan is rectangular and the long edges are cut vertically, but each end of which is scrolled in a volute producing the appearance of a cylinder or of a spiral, according to whether it is viewed from the front or side; the whole is crowned by a rectangular abacus.(229; 236; 238; 244).

A chronological classification of the various forms, that h have clothed the Ionic capital permits both to discern its origins and to render account of its relief, whose classical formula is a hybrid of two different orders.

Primitively, it only comprised the upper part, the slab and the volutes. There further existed two variants, both originated in continental and insular Ionia.

A primary one, examples of which have been discovered at Neandria, in the isle of Lesbos, at Napea, at Messa and at Mitylene, formed the structural support by carving in an oblong block a very much conventionalized image of a flower, in which two divergent and involuted sepals enclosed a group of petals

arranged in form of the palmatium.(239,1,2).

This type is rich and grand in effect, but relatively difficult in execution, was in competition with another -- very characteristic specimens of which have been found at Delos and at Athens -- which was only an economical imitation, and which was superior to it from the structural point of view. It was an oblong prism, whose narrow ends presented the roundness of a cylinder -- they are termed bolsters,-- while on each longer face an engraved or painted line represents the scroll of a v volute.(239,8,9,10).

These three happy arrangements are not at all unknown to us, for we have met with them in Egypt, Assyria, Phoenicia, and among the Hittites of Cappadocia. [1] (239,4-8,11-13); fertilized by Hellenic genius, they gave birth to two masterpieces of architectural sculpture, the Ionic and the Corinthian capitals.[2]

Note 1. See Figs. 55; 89,1; 98,7; 111.

Note 2. See pages 365-368.

Yet at the same epoch, the favor of Ionian architecture also passed to a capital fashioned like a basket of leaves or as a bell, of which we shall speak soon. [3] In the course of the 6 th century, it was thought to place on it the rustic cap, as described in the last place, and in relation to which it assumed the role of cushion or of echinus. Only, the abacus lost in height until it took the appearance of a slab, beyond which the bell widely projected. The reality and the form of this combination have been revealed to us by the very characteristic conformation of several capitals from Delos, and the Acropolis of Athens, of those of the first Artemesion of Ephesus, of that of the Column of Naxos at Delphi etc.(239,14-17).

Then came refinements. The cushion was relieved at its ends by the insertion of an abacus between its top vertically above the echinus and the underside of the entablature, impressing on it an appearance as elegant as expressive of its twofold r role of structural intermediate and sculpture, that of an elastic and flexible slab. A first means was to cut a "groove"on the edge, that also offered the advantage of recalling the flutes of the shaft; a second was to suggest the idea of a spring acting under a load by fashioning the middle part in the f form of an arc opening upward, as if it had bent under the pr-

pressure, with hanging ends in spirals, as if they were drawn by their weight.(236; 244).

In the shadow cast by the entablature, the round of the cushion, if it had been left continuous and plain, would have constituted a soft form, even an uncertain one. They did not fail to model it, either by grooving it with vertical channels, that also rendered the service of recalling the flutes of the shaft, or by reducing the bolster at the middle, variously treated by sculpture.(164; 239;9,15,16).

An ingenious artifice solved in very elegant fashion the difficulty resulting from the fact, that at the angle of a portico in the Ionic style, the last capital of a facade presented a bolster on that at right angles, instead of the two normal volutes.(241). It was thought to continue this troublesome b bolster under the architrave in return -- which gave in front one of the two volutes necessary; to fashion in its place a p portion of the bolster; finally to represent the second volute on a sort of horn in the form of a vertical disk, projecting diagonally from the capital; at the other extremity of this t the intersection of the bolsters forms a reentrant angle. At the beginning of the last third of the 5 th century, the application of this arrangement to the four sides of the capital c created a new type on a square plan, examples of which are furnished by the Temple of Phigalia and the Theatre of Epidauros, but which did not dethrone the traditional shape.

This further admitted complications; such as the insertion of a moulded cushion with a torus profile between the abacus and echinus, and between the latter and the shaft; such again was the modeling of a high collar at the top of the latter -- both observable on the northern portico of the Erechtheion. (244).

More than the Doric, the Ionic capital was affected by the evolution of the Grecian orders in the sense of a greater slenderness. At first, its part in the total height of the column diminished in much greater proportions. [1] Besides its sculpture was the object of various modifications, with the view of developing in the spectator the impression of an increased slenderness of the support; at first this was an enlargement of the top of the abacus,[2] that Ictinus tried at the Temple of P

Pnigalia, evidently with the view of raising the eyes (242,5); then -- witness the order of the Temple of Athena at Priene a and that of the Philippeion of Olympia -- this was an extreme thinness of the slab (242,2,3; 238); finally this resulted in the suppression of the border marking the lower edge of the s slab.(242,4).

Note 1. The capitols of the Didymeion are one third as high as those of the Propyleion of Athens, while the Doric capitals of the Temple of Nemea are only half as deep as those of the Parthenon, although for both the chronological interval may be nearly the same. (Athena Nike, 1\11; Erechtheion (east) 1\12; Propyleion, 1\14; Aezani, 1\25; Didymeion, 1\33).

Note 2. Compare the curious resemblance of this conformation and of the outline of the Hittite capital.(Fig. 98,7).

The Entablature. -- The Ionic entablature is distinguished from the Doric by more simplicity in composition and less freedom in form; indeed it comprises as essential elements only the two indispensable members, the architrave and the cornice, and as the rule for careful edifices, when it inserts between them a frieze, this betrays its structural uselessness by the absence of all modeling of a monumental order; on the other h hand, it multiplies the divisions, and it softens the accenting of the profiles.(229; 236; 243; 248). [2]

The Architrave. -- Its front surface is accented by the projection, twice and often thrice repeated, of bands slightly p projecting beyond each other. As in the Doric style, its upper limit is distinctly marked by a relief of a moulding; but this is profiled in ogee form.

Lower than the architrave -- the difference equaling a fraction of the latter varying between 1/12 and 1/4 -- the Ionic frieze forms a band, sometimes plane and sometimes sculptured -- as at the Temple of Athena Nike (164; 229; 236; 243); indeed a sort of diadem on the facade of the edifice.

By its general form, the Ionic cornice approaches the Doric; what differentiates it are the peculiarities of the secondary relief. The principal one consists in the mode of joining the soffit of the cornice to the face of the entablature; it was most frequently realized by means of a simple ogee moulding ((201,8; 229; 236), also sometimes -- witness the caryatid por-

portico of the Erechtheion (254) and numerous examples presented by the monuments of Asia Minor, Priene, the Didymeion etc. -- by the aid of a row of dentils, i.e., by projecting rectangular blocks regularly spaced according to their width and projecting beneath the cornice like the projecting ends of the j joists of a covering.(210,3,5,6; 243).

As for the pediment, it is distinguished from the similar D Doric one only by its smaller height, which does not exceed 1/8, and frequently from the 4 th century even 1/10 of the length of its base.(220). In the case when the cornice of the entablature comprises dentils, these quite frequently appear beneath the inclined cornice.

III. Different Styles.

I. Columns with Capitals in form of a Bouquet or Bell.

The Corinthian Formula.

To the relief formulas of the Doric and Ionic orders, Grecian architecture associated in all epochs, though in a lesser degree, a third one, differentiated from them both by its general form, which is that of a basket, and by the details of i its moleding, that reproduces appearances of a plant nature.

It otherwise conceives several variants, that may be classed in three categories.

Types in Form of a Bouquet.

A first one is characterized by its resemblance to a bouquet of regular composition and groups two different types, one stumpy and the other slender.

On the one hand is the relief of sometimes one but more frequently two rows of leaves, these being smooth or goffered, s slender, oval or square; sometimes all are recurved or scrolled; sometimes with two rows, the upper one inclined and the l lower one upright, in the image of the petals and sepals of an expanded flower. The last arrangement as noted later, obtained the favor of the Doric style for the cornice of a wall. Specimens of this kind of capital exist for all epochs of Hellenic architecture. [1] Its oriental origin is certain, being attested by a striking relationship with Egyptian, Phoenician or Assyrian motives (245,4-6).

Note 1. 7 th century, ruins of Neandria; 6 th century, Temple of Naucratis; 6 th - 5 th centuries, votive Column of Esc-

Eschines at Athens; Hellenistic epoch, Aegae (245,1-3).
364 The slender type (to it is applied calathos, the Grecian na-
me of a basket) is either in the image of a group of palm lea-
ves -- this is the case of the capitals discovered at Delphi,
and at Pergamus in the ruins of the Temple of Athena Polias (
(4 th century) (246,1,2), or that of a tuft of acanthus leaves,
like the finial of the Monument of Lysicrates (190) and the c
capital of the votive Column of the Dancers at Delphi (246,3).
Its affiliation is evident; it is a replica of the capital of
palm shape, that Egypt loved in all epochs, particularly in t
the Saitic, which was precisely that of its first relations
with the Greeks (246,4).

Type in Form of a Bell.

The second sort is characterized by the resemblance of its
form to that of a bell with projecting square cover, surround-
ed by two rows of leaves, one closely applied to its surface
365 and extending to its top, the other recurved at top and limit-
ed to the lower zone. The foliage of the former is always lan-
ceolate, while that of the second is of the same species -- t
thus at the Tower of Winds at Athens (247,1), sometimes that
of the acanthus, as the case for a votive column found at the
Theatre of Dionysos in the same city (247,2). It is again on
the banks of the Nile, by passing through Cyprus, that ends t
the search for the origins of this type; for it repeats that
of the bell form, excepting the two differences of execution
in relief decoration, that Egyptian art limited itself to imi-
tate by painting, and the addition of a projecting slab.(247).

The Corinthian Formula.

The third class, last to be cited in chronological order, b
but whose fortune was by far the most brilliant after the 4 th
century, is that of the Corinthian capitals. First employed f
for internal colonnades, it was presented on the facade by the
declining Hellenistic architecture, notably at the Temple of
Zeus at Labranda and the Olympeion of Athens (166).

If we credit Vitruvius, the Corinthian capital owed its exis-
tence to the invention of Callimachos, a goldsmith at the end
of the 5 th century, a native of Corinth, the same who fashio-
ned the golden lamp of the Sanctuary of Athena at the Erechth-
366 eion. [1] The truth is, that it was known before the era of Cal

Callimachos, since about 430, Ictinos chose it for the capital of an internal column of the Temple of Phigalia, and that without mentioning the striking analogy of its forms with those of certain Egyptian types, [2] it was quickly recognized as a hybrid, combining with the characteristic elements of the bell type the volutes and the palmatium of the primitive Ionic formula of Asia Minor (249).

Note 1. According to a graceful legend, it was inspired by the sight of a tuft of acanthus leaves on the grave of a young girl, enclosing a basket with a projecting cover, that forced the leaves to become recurved.

Note 2. See Figs. 55; 56,8-10; 58,10-13).

Further, several varieties are known, that may be placed in two series, each divisible into two groups.

The first is characterized by the preponderance of the volute element; sometimes -- as proved by examples furnished by t the Temple of Athena Laphria at Messene and by the Palestra of Olympia -- it comprises but a moderate height (249,1); more f frequently -- witness the capital of the Temple of Phigalia -- it admits a height almost doubled, and it fills the space between the angle volutes by means of a pair of reversed scrolls supporting a palmatium.

On the contrary, in the second category, the foliage dominates to the point of sometimes -- as observed on the Philippeion of Olympia -- requiring a formation of the volutes as sprays of acanthus and the sacrifice of the inner scrolls (249,3). These always persist in the normal arrangement illustrated by the masterpieces realized by the Tholos of Epidauros, the Monument of Lysicrates, and by the Olympeion of Athens.(249,4,5; 248; 250). From the 4 th century, two improvements were made in the shape of the abacus, which made it accord with the general outline of the bell; its ogee profile and the concave curve of its sides, generally accented at the middle by a palmatium or the image of a fruit.

Grecian architecture did not feel the need of creating a third order, and when it employed the Corinthian capital, it borrowed the remainder of the elevation from the Asian variety of the Ionic style; such as a shaft channeled by 24 flutes, an A Attic base on a square plinth, and an entablature in three pa-

parts with a dentil cornice. The proportioning of the elements was similar, [1] but their relief comprised difficulties; the diminution of the shaft was less and its entasis less evident; the cornice was sometimes -- as observed on the Temple of Claudius Caesar at Ephesus -- was supported by a series of consoles (251,5); especially the frieze was lower and was distinguished by a wavy profile, seen as a sketch on the Tholos of Epidauros and in the very free examples on the Temple of Labranda, the Temple of Claudius Caesar at Ephesus, at Salonica etc. (251,2,3,4). A peculiarity -- notable on the "Column of the
369 Dancers" discovered at Delphi, on fragments uncovered at Athens, and on the representations by paintings on vases -- is a curious naturalistic conformation of the shaft in the image of an articulated stem with rows of acanthus leaves, at the bottom of the trunk and at each reduction in diameter.(189). As for the ante, its appearance is sometimes that of the end of a wall in the Ionic mode, sometimes -- thus on the Monument of Ancyra (252) -- that of a pillar with capital, and sometimes that of an engaged column, as at the entrance of the Stadion of Olympia.

Note 1. Ratio of diameter of column to its height.

Olympeion of Athens	1 to 8.82
Temple of Labranda	1 to 9.50
Temple of Claudius Caesar at Ephesus	1 to 10.50
Choragic Monument of Lysicrates	1 to 10.70
Diminution per foot in height.	
Choragic Monument of Lysicrates	0.004 inch per ft.
Olympeion of Athens	0.0044

370 II. The Pier. The Caryatid.

To the rule of the formation of the isolated support as a c column, Grecian architecture presents two exceptions.

The Pier.

The first, examples of which may date from the 4 th century and are furnished by the Monument of Thrasyllos at Athens, the propyleion of the Temple of Athena at Priene, and doubtless a also by the Arsenal of the Piraeus -- resulted from the use of piers shaped like an ante of the Doric or Ionic with very slender proportions (253; 219,12). Their faces were sometimes fluted; they were sometimes decorated by an engaged column, as t

the case in the Hall of the Bulls at Delos, and sometimes by a figure sculptured in more or less high relief-- witness the Incantada of Salonica.

The Caryatid.

The other type, which was in favor in all epochs of Grecian architecture, and whose most celebrated works belong to the Treasury of Cnidos at Delphi and the porch of the Erechtheion (163; 254), is the caryatid, a statue of a woman standing, on the head of which an imitation of a basket expands after the manner of a capital. Admirably claculated to give to the mind the ideas of strength, of ease and of unity, and to the eye a dominant impression of verticality, the sculpture of the caryatids of the Erechtheion is as architectural as statuary, an alliance of pleasing and expressive human appearance and with the exercising of a structural function. Equal praise is further merited by the colossal figures 25.2 ft. high, and cut in 12 courses of the wall, which took the part of consoles at the Olympeion of Agrigente.

371 Chapter 7. The Effect.

III. Effects of Ornamentation.

At all epochs in its history and in whatever style it built, Grecian architecture loved the luxury of ornamentation. Two distinctions are always imposed; very vivid in the primitive epoch, restrained in the second half of the 5 th century, the taste for this sort of effect was regularly developed after t the 4 th century, a little more in each generation, until the errors of the passion; on the other hand, it was more essenti-
372 al to the Ionic mode than the Boric, and still more for the C Corinthian than the Ionic.

Effects of the Material.

And first Grecian art sought for the appearance of materials suited to please the sensuality of the age. Every time that it was able, it constructed entirely in marble, and if necessary to satisfy itself with materials of poor appearance, it d did not fail to mask them by a covering. Ordinarily this was a coating of stucco composed of gypsum and marble dust, possessing rare solidity at the same time as susceptibility to the most beautiful polish. In the primitive times, particularly in Sicily and Magna Grecia, they still loved to cover the upper parts of an edifice -- the most apparent in both stone and wood -- with facings of that dense and smooth terra cotta, that Hellenic industry excelled in manufacturing, notably at Corinth (255). Thus it occurred -- this was the case for the f first Temple on the Acropolis of Athens and for that of Zeus at Olympia -- that a monument in limestone was crowned by a c cyma and tiles of marble (256; 257).

373 II. Effects of Color.

Yet however precious the material and however perfect its treatment, the Greek was not at all satisfied, if it was not coquettishly painted in brilliant and varied colors.

Long unperceived, contested in principle by northern esthetics, when this did not take into account the difference in climatic conditions, the polychromy of the edifices was in all epochs one of the fundamental rules of Grecian architecture, and a well informed judgement does not criticize this. Indeed by reason of the brilliancy of the light and the vivid reflections, of the vigorous coloring of the sky and of the landscape

and the delicacy of the ornamentation on even the higher parts, it was for Grecian architecture a matter of necessity, as much if not more, than of taste. Doubtless -- all their artistic productions fully attest this -- the Greeks adored color; but in this case it was indispensable to them to ensure the freedom of the monumental outline and the visibility of the details in relief, as well as to avoid a violent contrast -- antipathetic to their eyes, smitten with harmony -- of a cold whiteness of stone with the warm tones of the surrounding sky and earth, as also of a strong shadow with the sparkling clarity of a part of the stucco or the illumined marble.

It was not to a natural polychromy, to a combination of stones of different tints, that the favor of the Greeks passed. Very rare are examples of marquetry in stone. Athens offees some to us; the construction, by means of the blue marble of Eleusis, of a background for the figures of the frieze of the Erechtheion, a threshold in the transverse wall of the Propyleion, an architrave for the windows of the Pinacothek etc.

On the other hand, they voluntarily utilized metal, either making of bronze an accessory part, such as the cresting of t the Philippeion at Olympia, which imitated a poppy flower, or again the shields sometimes fixed on an architrave, or rather -- which was current practice in the Ionic style -- that the projections of an ornament were gilded.

But it was substantially from painting, that the Grecian architect demanded his effects in polychromy; he employed this to coat the surfaces, to illumine the reliefs, as well as to define the form of an ornament or of a figure.

The processes were various. Operating on stucco, the color was sometimes mixed with stucco during its preparation, and sometimes it was mixed with a vehicle and spread over the surface of the coating while still fresh or already dried. Was this of marble, it received the impression of the color by the encaustic process used hot. Frequently the places to be tinted were not the object of any preparation; they were generally defined by an incished line, and sometimes even slightly sunken; the adhesion of the painting to the marble was favored by roughening it.

As appropriate, monumental Grecian polychromy admitted only

flat tints, frank tones, harmonies very simple and vigorously contrasted, notes clearly defined by bordering or dividing lines. As for the tones, each of the great epochs of the architectural history of Greece had its own taste; very warm in the 6 th century, they became lighter gradually after the 5 th; t the fact that this evolution of polychromy corresponds chronologically with the substitution of marble for terra cotta for the roofing, induces one to think the former in good measure a result of the latter.

315. The palette was very limited. The ceramist only charged his own with yellow ochre, reddish brown, black and a little white; the painter particularly employed blue, red and yellow.

It is not agreed in regard to the proportion in which the e elevation od a Grecian facade was illuminated. Was this confined to the upper portions, or did it also extend to the walls and the columns? Was it less when the edifice was of marble, than when it was of stone covered by stucco? What is certain is, that its part was greater when applied to the Doric style than to the Ionic, which employed sculptured decoration far more than the former, and more considerably in the monuments of the Ionic style, than in those according to the Corinthian formula, of all most lavish in sculptured ornamentation. On the other hand, it appeared well, that for reasons of harmony all white was proscribed, and that marble as well as stucco s should be slightly tinted yellow, the latter by a tint and the former by the application of hot wax, the last further having the useful effect of waterproofing to a certain extent the surface of the stone.

On a Doric elevation, the distribution of the tints appears to have been guided in a general way by the twofold desire to accent the principal lines of the monumental relief and to harmonize a rhythm dominated by a play of red and blue. [1]

Note 1. This was from the bottom upward:-- first a yellow ivory tint, more or less warm, broadly applied on the walls a and columns. Then a row of red bands extended by the illumination of the hollows of the annulets of the capitals; then the yellow band of the face of the architrave; above and on the b band crowning this, ran a red stripe, underlined by a blue line, that formed below each triglyph the edge of the regula support-

supporting the drops; above a series of large spaces, alternately either of blue and of yellowish white, or of blue and red; the first harmony corresponding to the contrast of the triglyphs with the plain metopes, the second to that of the triglyphs with the painted grounds of the sculptured metopes; higher, the mutules formed a series of squares alternating with the r red parts offered by the grounds of the separating channels; at the top triumphed the red on the blue, with which was colored the background of the tympanum. Finally, the drops scattered spots from place to place, generally red, sometimes of yellowish white and even gilded.

376 More reserved and essentially required by the desire to enhance the detail of the decoration, the polychromy of an Ionic elevation substantially consisted of impressions of red or of blue on recessed parts, and of gilding and enamel on the reliefs. As for the Corinthian order, its ornamentation was especially metallic, composed of lights in gold and the application of motives.

Necessarily, for positions less lighted -- ceilings of porticos and internal surfaces,-- the note was more brilliant, the tonality lighter, the scale more variegated. For these were put under contribution rare woods and costly stones, particularly in the Hellenistic epoch.

III. Effects of the Relief Order.

Yet the Hellenic architects possesses to a too high degree the feeling for suitability, to not prefer in monumental ornamentation that of the relief kind.

Doric Style.

For the latter the Doric style assigned quite strictly the place. And first in what concerned the column, it may be said that nothing was accorded to it, for at most the archaic epoch offers some specimens of gorges enriched by petty reliefs and of grooved abacuses. [1] (226,1). Similarly for the architrave; save for the only exception presented by the ancient Temple of Assos, the surfaces remained smooth. At two extreme epochs in the history of the order, the forms of the triglyphs are sometimes complicated by several lights, such as from mouldings, as at Temple C of Selinonte; motives treating the tops of the
377 chamfers on the angles -- as seen on the Temple of Dionysos at

Pergamus; projection of a relief shaped as figures of bulls, as the case at Delos, or in the form of emblems, as at Eleusis. Plain metopes did not shock the Greeks; they freely ornamented them by applied decoration in terra cotta or carved in solid stone; sometimes all of them -- witness the Parthenon -- more frequently only a portion, benefiting by thet distribution of the ornamentation. At first very much carved, particularly in case of a terra cotta covering (255), the cyma of the cornice no longer comprised more than a painted decoration after the classical epoch (225; 227). It was the same for the cap of t the wall;only the mouldings of the head of the ante were susceptible of sculpture, for example as may be verified on the P Parthenon. With the metopes, the tympanums of the facades were the oly portions of a Doric edifice ornamented, occupied as they were by a display of statues (213).

Note 1. Let us cite the columns of the Temple of Demeter a and of the Basilica at Paestum, of the Treasury of Syracuse at Olympia, and of a funerary Column of Corcyra.

Ionic Style.

On the contrary and particularly in Asia Minor, few elements of the Ionic order did not permit a richly sculptured ornamentation. Plinths and caps of the wall were equally accented by reliefs or carvings, and the north doorway of the Erechtheion shows, that the architrave of an opening offers the appearance of goldsmith's work in stone (262); sometimes the toruses of the bases of columns, and the deges of certain plinths were covered by embroideries and even figures; [1] a collar with numerous and various details surrounded the tops of certain shafts, [2] while others showed flutes enriched by simple motives.[3] Many times the echinus was embossed and engraved, while jewelry in stone or metal was scattered in the flutes, [4] on the volutes, on the bolsters, [5] and on the abacus of the capital. Ornaments always embellished the band crowning the architrave,[6] often the projections of its bands, [7] sometimes its front surface, [8] and even its soffit. [9] The treatment of the frieze is sufficiently characterized by the terms designating it, that of decoration-bearer (cosmophore) or figure-bearer (zoophore). The cornice was also sculptured on the cyma, on the surface of the facia, on the grooves of its soffit, on the fronts of the

dentils (229; 236;243). As for the tympanums of the facades, we have no evidence that they sheltered statues, and it is q quite probable that they remained vacant, in case the frieze was animated by figures.

Note 1. See the toruses of the north portico of the Erechtheion, the facades of the Didymeion and of the Artemesion of Magnesia; the plinths of the facades of the Didymeion, the bases of certain columns of the first and of the second Artemesion of Ephesus (235; 236; 234,5).

Note 2. See at Naucratis, Locri, the Erechtheion and Magnesia on the Meander (244).

Note 3. See Temple of Zeus at Aezani, where vases were sculptured on the fillets of each flute.

Note 4. See at the Erechtheion, Samothrace, and Temple of Apollo Smintheus in the Troad.(244; 238).

Note 5. See at Magnesia on Meander, Pergamus, Propyleion of Priene, Salamine in Cyprus, Temple of Julius Caesar at Ephesus.

Note 6. See Didymeion, Artemiseion of Magnesia, and the Great Altar of Pergamus.(236; 243).

Note 7. See at Priene, Magnesia and Pergamus.

Note 8. See at Erechtheion, porch of caryatids.(254).

Note 9. See at the Propyleion at Pergamus; portico of Temple of Athena Polias, Didymeion, Erechtheion, and Temple of Athena Nike.

399 Finally, to the use of the Corinthian capital corresponded a real prufusion of all ornaments of which an architectural m member is susceptible.(248; 252).

Whatever the order selected, the beams, coffers and slabs of the ceilings received a sumptuous decoration by varied sculptures.

IV. The Style.

In a general manner, the modeling of this secondary relief manifested that certainty of taste, proofsc of which abound in the preceding Chapters; the relief is always proportioned to the place occupied by the motive, to the lighting received by it, as well as to the distance from the point of view; low on a frieze, high in the recess of a metope, absolute in the recession of a tympanum. Always from the 4 th century, monumental sculpture was evolved in the same, both of an accenting of

the projections and recesses, and of a broader and more nervous composition. [1]

Note 1. For example, we may take as terms for comparison, the north facade of the Erechtheion, the Temple of Tegea, the Didymeion, and the Great Altar of Pergamus.

V. The Motives.

Geometrical figures, images of objects, of plants and animals, of human forms, all the categories of motives usable for
340 decoration, Grecian architecture put under contribution. Important in archaic times, the vogue of the former diminished f from the end of the 6 th century to the profit of the floral elements, which in their turn found competition in a certain measure, particularly from the 4 th century, by those derived from animated nature.

Geometrical Ornament.

Geometrical ornament substantially constituted the current decoration. It did not comprise numerous varieties. In the order of frequency of use were:-- a row of spherical or oblong beads separated by disks set edegwise, by which bands and astragals were relieved (261,13,14; 263); the fret, determined by regular revolutions, usually angular but also sometimes curved, a line or narrow band, sometimes interrupted at equal intervals, but more frequently continuous (261,9-11; 248; 252); the interlaced band arranged in various ways, which obtained the favor of the 4 th century, as well as that of the 6 th century (261,12,15; 265); the cable and the twisted fringe. The geometrical kind equally had its place in the covering ornamentation. The archaic epoch loved the chessboard of squares or rectangles, scrolls, and to a lesser degree chevrons (256), in a all times groups of lozenges were the fashion; [1] less was the vogue of cruciform or star arrangements (261,29) and of scattered disks, as may be seen at the Erechtheion and on the architrave of the porch of the caryatids.(261).

Note 1. See at Olympia the Treasury of Gela (4 th century), the Philippeion (6 th century); at Pergamus, the Temple of Dionysos (Hellenistic epoch).

Plant Ornament.

It was particularly by the plant kingdom that monumental Grecian decoration was inspired. The preferred motive was the

palm leaf, whose shape was often exquisite and was employed c currently for the fashioning of acroterias, antefixas and roof crestings, [2] frequently at a very large scale, as well as for the execution of a running ornament on the ground of a cyma, a frieze, a band or a cornice (261,23,24; 244; 263); in the second case, it frequently alternated with a bouquet of the lotus. (263). It divided the favor of the Greeks with a series of f falling narrow leaves, very much conventionalized and goffered in form, alternating with partial ovals, termed eggs, or with triangles, called heart leaves (261,17,18; 263). In the third rank may be cited the conventionalized image of the lotus bud or flower; somitimes it alone formed the running decoration -- sometimes alternately upright and pendant --; it was also sometimes partly connected with the palmatium, to compose a hybrid or to arrange a composite series (261,20-24). Then came t the rosette, at first simple with petals in small number and slightly treated (261,25; 256), later complicated by a multiplication of rays and a differentiation of the form; they were either employed in a series on bands -- such as that inclosing the north doorway of the Erectheion--, or isolated and realized in large proportions on the metopes, for example, as on the Tholos of Epidauros (261,26).

Note 2. See the acroterias of the Temple of Egina (259); of the Leonidaion at Olympia; of the Trajaneum at Pergomus.

The Hellenistic epoch again loved the acanthus scrolls, a p picturesque arrangement of the stems, leaves, flowers and even fruits of the plant, developed on the frieze with a harmonious balance of scrolls and of divergent branches (261,28; 243; 252). Alexandrine art created the vogue of the garland, [1] sometimes conceived as a rather loose tress of diversified elements, sometimes as a sort of continuous pad of imbricated laurel leaves; to this second type belongs some toruses of bases and numerous cushions of Ionic capitals. [2] (261,28; 235; 262). The Doric style, in accord with its severity, comprised the more simple arrangement of rows of recurved leaves of nearly rectangular form, and the arrangement of lanceolate leaves with rounded ends (261,16,19).

Note 1. For example, see those shown by the entablature of the Temple of Athena at Pergomus, which may be dated from the

first third of the 2 nd century B.C.

first third of the 2 nd century B.C.

Note 2. See for toruses, the colonnades of the Didymeion, Magnesia, Priene and Labranda.

The Animal Motive.

The appearance of the animal world never inspired monumental Grecian decoration, except in very restricted measure. Those most commonly employed were the lion's head for spouts of gutters (225; 236; 257; 260); the bull's head for the projections of the frieze, triglyphs,or the bolsters of Ionic capitals; (243); the forepart of the animal for the last purpose, [3] and also for the forms of corbels; [4] its entire outline to animate
378 the band of an architrave. [5] Let us add, in spite of their rarity, the image of the eagle, [6] and the representation, offered in the ancient Temple of Apollo at Delphi, of a combat of lions, bulls and stags. To this category are attached the fanciful forms of the griffin, frequently chosen for the form of
379 the angle acroteria or to animate the surface of the capital of a pilaster, by two monsters facing each other on each side of a plant motive (232). [7]

Note 3. See Temple of Claudius Caesar at Ephesus.

Note 4. See at Delos.

Note 5. See at Assos.

Note 6. See the frieze of the portico of Athena Polias at Pergamus.

Note 7. See on Temples of Athena at Priene and of Apollo at Pergamus.

The Human Motive.

In all epochs, the human figure was an essential element of the ornamentation of a Grecian monument.

At first and everywhere, it was assigned for significant representations, to that sort of niches formed by the tympanums of facades, the Doric metopes (213) and the panels developed by friezes (229; 236). The subjects were borrowed from mythology, heroic legends, and exceptionally from religion. Frequently it was the scene of a struggle; combat of the gods and t the giants, [2] of the centaurs and the Lapithae, [3] of the Greeks and the Amazons, [4] of the Greeks and the Trojans, [5] of Greeks and Persians; [6] or again the subject was an assemblage of the gods, [7], a divine or heroic story particularly interesting

to the city, [8] a ritual scene like the Panathenaic procession, that extended on the frieze of the Parthenon.

Note 2. See the eastern metopes of the Parthenon; the frieze of the Great Altar of Pergamus, and the northern frieze of the Treasury of Cnidos at Delphi.

Note 3. Western pediment of Olympia; western frieze of Theseion (213); southern metopes of Parthenon; Temple of Phigalia.

Note 4. Temple of Phigalia, Artemeseion of Magnesia.

Note 5. See Temple of Aphaia at Egina.

Note 6. See the west, north and south sides of the frieze on Temple of Athena Nike (164).

Note 7. See detail of the frieze of the Parthenon; eastern side of the frieze of the Temple of Athena Nike (164); frieze of Treasury of Cnidos (163).

Note 8. Thus on the eastern pediment of the Parthenon, the birth of Athena, and on the western tympanum of the same temple, the contest of the goddess with Poseidon on the subject of the patronage of Attica; on the eastern pediment of the Temple of Zeus at Olympia, the preparations for the race of Pelops a and Oenomaos; on the northern and southern metopes of the Theseion, the exploits of Theseus.

On the other hand, the human form contributed to the decoration, properly so-called, sometimes presented alone, sometimes associated with ornamental motives. Thus the apex acroteria at the Temple of Egina was composed of a palmatium flanked by two female statues (259); on the Temple of Zeus at Olympia, of a victory; at Metaponte, a head within a circular medallion; at the angles of the pediment of the Asklepion of Epidauros r rose Nereids on horseback.(163). Thus again, images of the g geniuses frequently animated the capitals of antes or of pilasters in the Ionic or Corinthian styles,, [9] and it was not exceptional, at least in the Hellenistic epoch, that from the eye of a volute or even from the end of the bolster of an Ionic c capital projected a head in high relief. [1]

Note 9. See Temple of Ancyra (252) and the Didymeion. Also certain bases of the Didymeion (235).

Note 1. See the order of the facade of the Didymeion (243).

Various Motives.

Finally, Grecian monumental decoration employed representat-

representations of objects. Thus -- for example at the great Temple of Olympia -- a tripod formed the acroteria at an angle; it was also composed of trophies, such as decorated the balustrade of the portico of the Temple of Athena at Pergamus (167'; it carved the image of a vase in the hollow of a flute, as observed at the Temple of Zeus at Aezani.

386 VI. Decoration of the House.

The ornamentation of the Grecian house was in due proportion in the image of that of the monument. Such as revealed to us by the houses of the Hellenistic epoch discovered at Delos, T Thera and Priene, it was composed of marble parts, shown by t the columns of the portico, by the jambs of the doorways and sometimes by the walls, and by coatings of stucco embellished by paintings and by ornamentation in relief. The note of the polychromy first appeared on a high plinth of dark color, reddish-brown, dark blue or black; then on a zone of panels often enclosed by borders, colored in light tints and sometimes enlivened by representations of flowers AA in bouquets or garlands, or even by small figures; finally, on a frieze, which was composed of bands of red and blue, or of yellow and brown. T The relief decoration consisted of Doric friezes, cornices, consoles, ox-skulls and masks. The effect of color was completed by the variegated pavement, which was sometimes a regular pattern of squares of different marbles, sometimes a mosaic, more or less variegated.

Book IV. Eclectic Architectural Styles of the Persian and Roman Civilizations.

At two extremities of the antique world, in the Persia of t the Achamenides and in republican and imperial Rome, architecture developed in similar historical conditions,and by analagous ways accomplished comparable destinies.

In both places, it was at the service of a people naturally energetic and rude, which after having long vegetated in a rustic mediocrity, after a great struggle won supremacy over ancient and more civilized nations, being in turn conquered by t their civilization.

Just as the Persians, conquerors of the Mesopotamians, the Egyptians and the Ionians of Asia Minor, demanded instruction from them, after the Romans had triumphed over the Etruscans, the Carthaginians, the Greeks and the Orient, they placed themselves in their schools.

Thus the Persian and Roman styles of architecture resemble each other in this, that bort are derivatives, they again have this in common, that neither falls into a servile imitation. First, they did not proceed by mechanical repetition in general, but by thoughtful borrowing of elements; further, far from binding themselves to a single model, they practised an eclectic cultivation of all styles seen by them, and since they had energy and temperament, they knew how to realize some new combinations, several even being tasteful; finally, since they necessarily participated in the strong individuality of the n nations, that served them, they marked their productions with their own character and the best with an incontestable originality.

Let us add, that they shared the honor of having been imitated in their turn.

Part I. The Architecture of Persia of the Achemenides.

The primitive architecture of the Persians began late, at t the beginning of the 6 th century B.C., and its career was brief and terminated at the beginning of the last third of the 4 th century by the conquest of Alexander, at the same time as the end of the Achamenide dynasty. Its mature phase had lasted a little more than a century. [1] Its area is a long band extending from northeast to southwest, between the table land of Iran on the one hand, on the other being the Mesopotamian plains and the Persian gulf. The vestiges of its productions are not numerous, but their existence is sufficiently explicit, f for one to form a correct idea of its procedures and of its s style.

Note 1. We shall reserve for volume 2 of this history the examination of the vaulted monuments of Fars (edifices of Firouz-Abad, of Sarvistan etc.). In spite of the legitimate authority of the opinions of M. Dieulafoy, who has studied them, they do not appear to us to be attributable to the epoch of t the Achamenides. There are too many examples of the survival of ornamental formulas of the art, which created them, for us to accept his reasoning, substantially founded on the existence in these ruins, of motives characteristic of the primary architecture of Persia.

Chapter 1. The Demands. -- Monmumental Chronology and Topography. -- Physical and Human conditions.

The human and natural conditions of its development were not very brilliant.

I. The Requirements.-- Monumental Chronology and Topography.

And first it received but a very small number of demands of a funerary character, and it knew of no religious demand whatever.

The Persian faith required that the corpse should be destroyed by carnivorous animals, so that its impurity should neither pollute the earth, the water, nor the fire, thus there was no need for a tomb; places for exposure sufficied. But for t the superhuman nature attributed to them, the kings always had a right to burial, which must be conducted in a manner corresponding to their elevated dignity.

The religion of Zoroaster had small need of assistance from

the art of building. Doubtless Herodotus is mistaken in stating that the Persians had not been accustomed to erect statues, temples or altars to the gods, and that they regarded as fools, those who did so. But since the esoteric worship of Ahura-Mazda, of the good spirit, was reduced to the priests feeding the undying flame of a hearth, protected from natural and human impurities, and that the esoteric rites consisted in prayers and in sacrifices of horses and oxen on the high places, n nothing more was necessary than small sanctuaries and altars.

On the other hand, the primary Persian civilization was propitious to a brialliant flowering of civil architecture. Sovereigns, that could entitle themselves as kings of kings without lying, were counted among the most powerful, the richest and most luxurious of all time, and for each one of them were required magnificent palaces, specially erected for him, in t the measure of a semi-divine majesty.

Finally, the military character of the Persian monarchy and its extension by conquest favored a development of the art of fortification.

A primary demand came from the northern portion of the country under consideration, from Media, after its king Cyaxares h had taken Nineveh in 608 and had annexed Assyria. His capital, 3 Ecbatana, seated in the place called Hamadan at the feet of t the Elvend, became a considerable city, with a palace, whose grandeur and luxury was clebrated by Herodotos and Polybius.[1]

Note 1. Herodotos, I, 98; Polybius, X, 27.

Toward the middle of the 6 th century, it became the turn of the southern region to dominate; under the Achemenide sovereigns -- Cyrus, Cambyses, Darius I and Xerxes, it became the centre of a vast empire, that in spite of an obstructed impetus marked by the defeats of the Persians at Marathon and Salamis, (490, 480), remained spirited and prosperous until its conquest by Alexander. (324).

Master of Ecbatana in 550, of Babylon in 538, absolute sovereign of immense territories, Cyrus (559-529) established the seat of his government at Pasargade, in the region now named Fars, north of Shiraz, in the plain of the elevated valley of the Polvar, at the place termed Meched Mourgab. Of this capital, which seems to have been rather modest, there remains me-

merely rare vestiges; altars, the terrace of a Palace, called by the natives Takt Madere Soleiman, i.e., "Throne of the Mother of Solomon"; three piers and one column permits the restoration of a Palace of Cyrus; a funerary monument is considered the tomb of the sovereign.

A second evidence is of quite other importance and is the g group of ruins a little lower in the same valley, which recalls the memory of the commands of Darius I (521-485), of Xerxes (485-472), and of their supcessors.

In the slopes of a spur of the mountains, naged Naksh-i-Rustem, four rock-cut tombs exhibit monumental facades, the most ancient of which is inscribed with the name of Darius, while at the foot of the cliff rise a funerary tower (fire temple ?) and two altars.

At the mouth of the river in the plain of Merdacht, the city of Istakhar retains portions of edifices and a fortified gate.

Finally and particularly at the place named Takt-I-Djemschid, on a vast terrace partly formed by the leveling of a rocky projection and partly by the construction of retainiug walls bearing an inscription in the name of Darius, the ruins of Persepolis compose a grand entirety of monuments for habitation or ostentation, a Palace of small dimensions and a columnar hall called "Hall of a Hundred Columns", both designed for Darius; a great Columnar Hall, a Palace and a Triumphal Gate, attributable to the reign of Xerxes; finally a third columnar Hall a and a third Palace.

A little farther south, Shiraz shows the remains of a royal Palace.

At Hamadan in Media, the base of a column recalls the existence of a Palace of Artaxerxes II; a precipice of Mt. Bissotoun or Behistoun near Kermanschah, dominating the great route from Ecbatana to Babylon, exhibits a great tablet cut in the rock, commemorating the glory of Darius.

Yet the true capital of the Achemenide empire was the old Elamite city of Susa, that the king of kings appreciated for the mildness of its climate in winter, and its fortunate strategic position, and where he received foreign ambassadors. The excavations of M. Dieulafoy have brought to light traces of f fortifications, the remains of a Palace of Darius I, burned a

about 440, those of a Throne Hall of Artaxerxes Mnemon (404-358), and parts of the ornamentation, all possessing the highest interest.

II. Physical and Human Conditions.

Excepting at Susa, the early architecture of Persia was developed in a mountainous country.

A climate with violent contrasts opposes burning summers to rigorous winters, and torrid days to glacial nights; it comprises hurricanes of unusual violence, abundant and prolonged r rains, with tempests of snow in the higher country.

From the point of view of the supplying the materials, Persian architecture was not spoiled by nature. Doubtless it found itself furnished with a very good stone, a compact limestone of yellowish or grayish color, stratified in very thick layers, permitting the quarrying of great monoliths. But rough and hilly ground, the steep slopes and the high altitude of the passes were opposed to transportation. The obstacles were the same in regard to timber, with which Persian construction was otherwise badly provided, because the extreme slopes of t the ground opposed the growth of great trees. Media, on the contrary, possessed great wealth of forests.

Human conditions were better. To the free labor of experienced workmen, attested by the engraving of mason's marks on the materials, the official architects could add the assistance of the labor of levies and of prisoners, furnished in abundance by a powerful and warlike royal government. Thus it again possessed the ability to import from afar and to raise up to Persepolis or Pasargade the materials refused by the country, notably timbers of great dimensions and of precious species.

Originated late, after the flowering of the arts of Egypt a and of Mesopotamia; practised by a people of recent civilization; largely pupils of the Medes and the Mesopotamians; fatally beset by the view of the monuments of countries conquered by the "Great Kings" -- Mesopotamia, Egypt, Syria, Phrygia, L Lydia and Ionia in Asia Minor; finally, certainly affected by the collaboration of artists and of artizans imported from those regions, Persial architecture must be, and was strongly i influenced and eclectic. [1]

Note 1. In the course of our description, we shall state

accurately, as far as we meet with examples, the nature and m mode of these influences and affiliations. Let us note here, that they appear to have struck the ancients. We read in Diodoros of Sicily (I, 46, 4):-- "The persians pillaged Egypt; a after having carried into Asia the riches of their temples, a and having taken there Egyptian artists, they built the famous palaces of Persepolis and of Susa". Recall that Nineveh was taken in 608 and Babylon in 538; that Egypt was conquered in 533; Lydia in 546; Ionia at the end of the 6 th century; that the Persians borrowed from the Medes their arms, military organization, their ceremonial and the costume of their kings, that they adopted cuneiform writing, and finally that Greek jewellers worked at Susa.

Yet the Iranian peoples, who practised it, possessed a strong ethnic [2] individuality and an incontestable artistic activity, that preserved them from an exclusive, stupid and servile imitation.

Note 2. This survived the conversion to Islam.

Not only did they perfectly assimilate the borrowed elements, but even modified and recast them, and from the combination w with their own inspirations, they composed a very successful union of fine quality and grand appearance with very tasteful parts having a great effect, and which in turn became a model for India and eastern Asia. [3]

Note 3. See volume 2 of this History.

Chapter 2. Programmes and their Realizations.

I. Domestic Programmes.

The programme of a Persian palace, according to the mode in Mesopotamia, comprised the elevation of its site on a natural or artificial terrace, easily accessible by grand stairways.

In regard to the arrangement of the Persian harem, we lack information, the oriental method of constructing the private dwelling of crude bricks having destined this sort of Edifices to a speedy and complete ruin.

On the contrary, the arrangement of the royal apartments is revealed to us in sketched form by the Palace of Cyrus at Pasargade, and in completed form by those portions of the ruins at Persepolis, that pass for the remains of the Palaces of Darius and of Xerxes (266,5). A central columnar hall was intended for receptions, and was surrounded on three sides by rooms for various purposes, doubtless for use as offices and living rooms; on the fourth it communicated through five doorways with a double portico, that formed a monumental entrance to it, and which enclosed by two wings, utilized as guard room and waiting room. Perhaps it is necessary to see in this programme an extension of that of the Hittite and Assyrian hilani. (Pages 126; 152-153).

For solemn audiences the king of kings had at command vast throne halls designated by the name of apadana. Nothing does more honor to Persian architecture than these great structures. Square in plan, they were always preceded by a double portico, and often flanked by another on each lateral facade. Sometimes -- this was the case with those of Persepolis, where the w winter is rigorous -- they were entirely enclosed by walls of crude bricks pierced by great doorways,[1] sometimes -- thus at Susa where the sky is more clement -- they were open on the f front side, as they are against the "Talars" of modern Persia. (266; 267). (Volume 2). Indeed it was possible to enclose it at pleasure, as well as to subdivide it by means of those fabrics, that the Book of Esther (I, 5, 7) represents to us as "suspended by cords of linen and rings of silver from from columns", the taste for which and their manufacture have continued in the smae places until our time. The apadana was perfectly approproate for its purpose; thanks to its dimensions, to

the slenderness and wide spacing of the supports of its ceiling, it permitted a multitude to behold the sovereign seated at the end of the central aisle on one of the high platforms, whose image has been preserved to us by the monuments represented. So that the architecture of the Persia of the Achemenides proposed the primary solution for the problem of the assembly hall, which should be adopted by the Parthian, Sassanian, Roman and Christian architects. (Page 459 and volume 2).

Note 1. These walls have disappeared; but their existence is proved by spaces left in the pavement corresponding to their outlines.

The programme of a Persian palace comprised the construction of a great gate of honor, a specimen of which is presented by the "Propyleion of Xerxes" on the terraces of Persepolis. Its arrangement was borrowed from Mesopotamian architecture; on t the external and internal facades of a colossal structure of crude bricks, doubtless in the form of a group of symmetrical towers, were inserted two enormous stone doorway enclosures, giving access to a great internal vestibule, whose ceiling was supported by a group of columns.(265; 266,6; 267).

As for ordinary doorways, these were high and narrow openings, which were closed by porticos, rather than by leaves.(282).

Aqueducts and sewers extended in the ground. Gardens with basins were the necessary complement of every dwelling of some importance.

II. Military Programmes.

It was a very wise system of fortification, further derived from that perfected by Mesopotamian and Syrian engineers, which M. Dieulafoy has restored from the results of his excavations at Susa.(268). First was opposed to the assailants the f formidable successive obstacles formed by a wide moat filled with water, an embankment, an outer wall about 59 ft. high and 71 ft. wide, a space measuring 29.5 ft. high and 32.8 ft. wide, an internal ditch, a rampart of the same dimensions as the outer wall, a citadel, and finally a keep. Besides the most minute precautions were multiplied, to prevent approach and to thwart attempts by mining; battlements and balconies at the tops of the towers, casemates with shooting slots at Mid-height, permitting the command of the ground near as well as dist-

distant; the internal ditch between the second enclosure and the third, to better baffle mining works and the advance of t the adversaries, after mastering the first line of defense;
377 particularly zigzag lines and flanking towers, that suppressed the narrow passage.

The remains of a gateway near Istakhr give an idea of the a arrangement adopted by the military architecture of Persia to arrange and at need obstruct passage.

III. Religious Programmes.

The arrangement of the Persian sanctuary (ayadana) revealed by the excavations at Susa is well adapted to its purpose of protecting the sacred fire from any pollution and even all indiscretions.

On a platform elevated about 6.6 ft., the twofold obstacle of a rectangular enclosure and a series of corridors perfectly realizes the isolation of the sacred place, composed of a court and a holy of holies. This was situated at the rear of the former and opposite the entrance; it was a raised square chamber with its ceiling supported by four columns, preceded by a vestibule accessible by steps; at its centre was placed the hearth.(269).

As for altars in the open air, those preserved at Pasargade and at Naksh-i-Rustem near Persepolis, show that they were composed of a rectangular base about 6.6 ft. high, with a flight of steps at one side, and of a block with its top hollowed instead of a brazier.

378 IV. Funerary Programmes.

The funerary architecture of Persia of the Achemenides conceives three types of monuments.

A first, of which the "Tomb of Cyrus" at Pasargade offers an example, perched a rectangular sepulchral cell in the form of a house, with a low and narrow opening, on the top of a truncated stepped pyramid; it planted this in a rectangular enclosure bordered on three sides by porticos, which were again isolated by a concentric enclosure.(270,1,2).

A second is observed at Persepolis (Nakhs-I.Rustem) as well as at Pasargade, placed the chamber at mid-height of a rectangular tower about 39.4 ft. high and about 23.0 ft. wide; a flight of steps rests against the facade in which the doorway w was pierced. [1]

Note 1. Tower of Pasargade; height 42.3 ft., width 23.3 ft.; floor of the chamber is 16.7 ft. above the ground.

The third formula was applied several times at Persepolis ((Naksh-i-Rustem) and constituted a rock-cut sepulchre excavated in the face of a cliff at about 65.6 ft. above the ground, a grotto divided into a rectangular vestibule parallel to the face of the mountain and a recess, whose floor was hollowed in coffers, more or less numerous; the whole being of modest dimensions. [2] (270,3; 272).

Note 2. At the Tomb of Darius the vestibule measures about 37.8 × 7.4 ft.; each of the alcoveu is about 8.2 × 7.4 ft.

The tomb was externally indicated by a great cruciform tablet cut in the rocky wall. [3] The lower arm was left plain and imitated a preliminary terrace; the upper exhibited a relief representing the sovereign standing on a platform supported by the provinces of his empire,and occupied in adoring the sacred fire, while Ahura-Mazda blessed it; finally the middle horizontal area presents the image of a mounmental facade preceded by a columnar portico, at the middle of which appears the entrance of the sepulchre.(272).

Note 3. At the Tomb of Darius, the cross extends to a height of 74.0 ft. and to a width of 61.2 ft.; the vertical arms are 36.1 ft. wide.

Chapter 8. The Construction.

Persian construction indicates as much power as conscientiosness.

I. The Materials.

Eclectic, it normally and intimately combined bricks, stone and wood.

The facility of execution resulting from building in brick, particularly in a country so unfavorable to transportation as Persia, the faculty given by it for employing a great portion of unskilled workmanship, and finally the example of Mesopotamian art, their master, recommended it to the Persian architects. In fact, not only at Susa, but also at Persepolis and P Pasargade, the masonry was almost entirely of crude bricks, as proved by the ruins; for the peculiarity characterizing them, of being reduced to elevations of supports, stairways, jambs, columns, and the enclosures of doorways and windows, without the least portion of a wall, indicates that the walls were of the material, so eminently perishable as earth; and this negative evidence is confirmed by positive proof afforded by the vestiges of their locations, recognizable by omissions in the continuity of the pavement, permitting to appear the beds of gravel employed by the Persian builder for his foundations. [1]

Note 1. See pages 402, 403; figs. 271,1; 282).

The bricks were square and measured a foot (1.175 ft.) on e each side, with a height equal to one-fourth or one-half this unit. The burned bricks were much less employed, but still c commonly used for the facing of constructions of earth.

The civil programmes of Persian architecture could only be realized -- as we shall soon state when studying the mode of covering -- by means of a great quantity of beams of long spans, large dimensions, and unusually rigid. What the native soil refused was imported from the distant forests of the Caspian Sea, from Lebanon and Amanus, thanks to the means at the command of all powerful sovereigns, happy to distinguish themselves from their subjects and to manifest their independence of nature. Likewise for stone materials; no more than they h hesitated to bring from afar marble, porphyry, diorite and basalt, was it compelled to adopt the dimensions of the blocks to the conditions of transportation into the mountains. The

retaining walls contain stones 14.8 ft. long and 3.28 ft. high; like the lintels, the jambs are of a single piece; a jamb of the "Palace of Darius" at Persepolis is a monolith 22.3 ft. w high, and shafts measuring 49.2 ft. are composed of no more than three drums! Yet whatever the dimensions, the cutting was always excellent.

II. The Methods.

Persian construction is commended by the care always taken to ensure a stable site for its edifices. In the embankment enclosed by the stone retaining wall of the terrace beneath e each building, earth was first piled with good care taken to isolate it from the walls by a lining of rubble, and then a l layer of gravel 8.2 to 11.5 ft. thick. Incompressible and still pervious, this ballast presented an excellent support for the walls. For an isolated support the additional precaution was taken to insert between the base of the column and the gravel a large stone slab with the purpose of distributing the pressure over a larger area and of diminishing the risk of displacement. Careful drainage completed these measures.

Like those of Mesopotamia, the Persian architects gave to walls of crude bricks a considerable thickness, [1] and protected them by facings of mortar, stucco, or of burned bricks.

Note 1. Those of the Apadana of Artaxerxes at Susa are 18.4 ft. thick.

Stone construction, which sometimes competed in massiveness with that in earth -- the transverse dimension of the wall supporting the terrace of Persepolis is not less than 13.1 ft. -- did not fail in its care for the jointing. Even when in roughly wrought parts, these were made irregular, it imposed an adjustment so minute, that the jointing is sometimes scarcely d distinct. A careful elevation -- for example, that of the retaining wall of the Palace of Cyrus at Pasargade -- comprises only uniform blocks with beds properly leveled and a correspondance of the joints in alternatiug courses. It was lined with rubble set dry, and this was accurately leveled to the top of each course of stones. (271;4,5).

There was no bonding with mortar, but a consolidation by means of iron cramps in dovetail forms (271,3); the face of the wall was vertical, even when when retaining walls; only in th-

that case their internal face was stepped in order to increase their bearing.

It is a further proof of the conscientiousness and of knowledge in Persian construction, their method of strictly connecting the elements of a structure of mixed stone and earth. I Indeed on the face of the pier or jamb joined to a brick wall, they sometimes arranged a projection to tie the wall, sometimes a slot into which this extended.(271,1).

The openings of doorways and of windows were rectangular and were spanned by lintels.

For the completion of a floor, a pavement was the rule, either in common stone as at Persepolis, or in marble as at Susa.

There should be reckoned among the essential traits of the primary Persian architecture, the extreme boldness of the forms of its isolated supports. Not only did it risk the heights of 65.6 ft., [1] but it again dared to reduce the mean diameter of the shaft to even 1/13 of that dimension, thus realizing a slenderness without a rival in antiquity.(272; 273; 277).

Note 1.

Hall of 100 Columns at Persepolis,	29.4 ft. high,	3.08 diam.
Palace of Cyrus at Pasargade,	29.4	3.34
Propyleion of Xerxes,	54.4	5.12
Apadana of Xerxes,	64.0	5.20
Apadana of Susa,	65.6	5.22

This quality is so much the more characteristic as the intercolumniations were exceptionally great, extended to the point, that those of 28.7 ft. exist. [1] That represents a ratio of void to solid equivalent to between 5 and 6 to 1, while at Karnak the proportion is less than 2 to 1, and in Greece in the c case of the widest spacing, it does not exceed 2 2/3 to 1. It is only just to state, that the comparisons of Egyptian and G Grecian porticos with Persian must take into account the fact, that the entablatures of the former were of stone, while that of the latter was of wood.

Note 1. The intervals between axes measure:--

Hall of 100 Columns	20.3 ft.
Propyleion of Persepolis	27.2
Apadana of Susa	27.6
Apadana of Xerxes	28.7

Indeed this tallness of the supports and their wide spacing

combines with the greatness of the halls to forbid to Persian architecture the stone ceiling after the Egyptian or Grecian fashion, as well as the brick vaults in the mode of Mesopotamia. Although no example of the Persian covering remains, we are not only decided on the material, but also on its arrangement. Ancient texts [2] inform us of what an enormous quantity of cedar wood entered into the construction of the Achemenide palace, and the explorers of them have found on the pavements of those destroyed by fire thick layers of cinders, that cannot be explained without the hypothesis of a covering of carpentry. A faithful image of this is offered to us by the facades of the rock-cut royal tombs, while the exact profile of the e entablature is revealed by the recesses at the tops of the piers to receive their ends. By means of a series of great cedar beams, so arranged that each layer projected beyond that b below it, the Persian constructor built up enormous beams and strong architraves, which supported a framework of timbers covered by planks. For greater safety, the columns were connected together at right angles to the architraves by beams fixed on their capitals. [1]

Note 2. Quintus Curtius. History.(V, 7, 5).

Note 1. The mode of covering just explained and the slenderness of the columns mentioned indicate the customs and a conception of the carpenters, who found themselves in opposition to the natural conditions of a country with so little wood as Persia proper. But it is proper to recall that before possessing the supremacy in the East, Persia had been subject to Media, and that it manifested the degree of its dependance by c considerable borrowings from it. Now the Median country is in proximity to forested regions, rich in excellent structural w woods, and indeed according to the testimony of Polybius, the Palace of Ecbatana contained enormous quantities of cedar and of cypress, especially employed for the beams of ceilings and the columns of porticos, so that we may infer, that the Median construction was substantially in carpentry.

The ordinary mode of roofing was that always preferred by t the East, and which is still common in modern Persia, that of the terrace, otherwise appropriate to a cilmate characterized both by torrid heat and deluging rains. The protecting cover-

covering is a mixture of earth and chopped straw, compacted by rolling and more than 3.3 ft. thick, supported at the sides by a parapet composed of a pile of timbers or a brick wall.(274,1). Still the Tomb of Cyrus at Pasargade and all funerary towers 4:6 preserved at the same place and near Persepolis show that Persian architecture likewise employed the roof in slopes or built in pyramidal form.(270,1; 276,1). The use of tile coverings is attested by a text of Polybius relating to the Palace of Ecbatana, and by the discovery at Susa of a system of terra c cotta plates with upturned edges, 1.70 ft. long and 1.15 ft. wide, with semicylindrical covering tiles and gutters with spouts.

Chapter 4. The Effect.

To the merits, that the analysis of its programmes and of i its system of construction have permitted us to attribute to Persian architecture, it is necessary to add that of the possession to an eminent degree, of the sentiment for a really monumental effect and for the conception of some truly superior formulas, some of which constitute the elements of the artistic treasury of mankind.

Perhaps because of an unconscious adaptation of their inventions to the varied nature, to the prodigious fortunes of their race, to the supreme power and the marvellous pomp of their kings; also perhaps since these were masters of Babylon and of Thebes, Persian architects passionately sought for and frequently realized picturesque and impressive arrangements.

On the other hand, they had the taste and the sense of harmony, of proportions and of rhythm.

I. Effects of Affective, Picturesque and Monumental Order.

They loved the effect of material splendor, which moreover was indicated, when it was required to create a ground for the majesty of a "king of kings". The terrace supporting the palaces of Persepolis occupies 1,450,000 sq. ft. (3 1/3 acres), a and the Apadana of Xerxes at the same place and that of Artaxerxes Mnemon at Susa respectively covered about 78,500 and 91,500 sq. ft. But -- an assured mark of a conception truly architectural -- the magnitude formed by them was much less t than that of the voids. Thanks to their method of designing at a great scale the plan as well as the elevation, and especially to spacing at great intervals supports of unusual slenderness, they impressed on these state buildings an admirable character of vastness. Not only halls like that of Susa, that of Xerxes, and that termed the "Hall of 100 Columns" at Persepolis, enclosed areas of about 39,800, 43,000 and 52,700 sq. ft., with capacities of 2,540,000, 2,750,000 and 2,045,000 cubic ft.; but again and in particular, their useful areas, after deducting the sum of the bases of the columns, was not less than 95.5, 95.25 and 96.36 per cent of the total area.! [1](267).

Note 1. Apadana of Susa; total area over all 70,000 sq. ft. Surface in clear in entrance portico 10,107 sq. ft.

Apadana of Xerxes at Persepolis; total area 78,500 sq. ft.

Hall of 100 Columns; total area 71,400 sq. ft.

[illegible]

It lacks a primary city, no temple of which [illegible]

[illegible] by Mesopotamia, the elements of the edifice [illegible]

[illegible]. Not only the group of the monuments of [illegible]

placed on a terrace more than [illegible] (fig. [illegible]), [illegible]

[illegible], and the edifice [illegible].

[illegible] is greatly [illegible] two [illegible]

[illegible]

To these different manifestations [illegible]

the tombs [illegible], as [illegible]

[illegible] (2/3).

[illegible]

Another proof of the high quality of Persian architecture is its marked preference for the effects of monumental relief.

It demands a primary one, an example of which is elsewhere offered by Mesopotamia, the elevation of the edifice on a raised terrace. Not only the group of the monuments of Persia is placed on a terrace more than 32.8 ft. high, but the surface of this is again arranged in three terraces of different heights, and each edifice surmounts a separate platform..

This method of associating the picturesque and the ground is again manifested in the arrangement of the stairways permitting access to the terraces. The one by which that of Persepolis is reached is grandly conceived; two divergent flights rise from the ground parallel to the retaining walls as vast stairways, from which two others converge toward a third, to the l level of the terrace; the length of the 111 steps was not less that 23.0 ft. with a rise of 4 inches. Moreover majestic landing was formed by an elongated platform parallel to the faceade and accessible by a flight of steps at each end; that provided on the north front of the third terrace of Persepolis measured no less than 222 ft. long and 16.4 ft. wide.

In the same spirit were treated the facades with double porticos and also the great Propyleion with its two internal and external entrances, each 19.7 ft. deep, 36.0 ft. high and 12.5 ft. wide, and their intermediate vestibule with ceiling on a group of four columns 54.6 ft. high. The proportions of Persepolis were built to impress the visitor by the length of a p passage of 122.3 ft., and by the contrast of its shadow with the brilliant illumination of the spaces preceding and following it.(265; 266,6; 277).

To these different manifestations of a desire to strongly impress the eye and the mind, we may still add that, formed by the royal tombs of Naksh-i-Rustem, at mid-height of a precipice between heaven and earth, in the condition of the deceased, half divine and half human.(272).

II. Effects of Secondary Relief.

The contribution of the effects of secondary relief to the appearance of a Persian edifice seems very unequal, according to whether a wall or a portico is observed, very little in the first case, and quite considerable in the second.

The definition of the mural elevation was satisfactory. High, projecting and accented by the corbelled projections of t the beam plates piled lengthwise on the wall and by the projections of the ends of the transverse beams, the face of the carpentry of the covering forms a plain and frank entablature.(2 (267; 272; 274). An imitation of its relief more or less summarized served to terminate a facade in stone. Thus at the summit of the retaining wall of the terrace of Persepolis, a course projected slightly and was surmounted by a row of dentils, the support of the parapet; thus again, this motive furnished the element developed at the tops of the funerary towers of Pasargade and of Naksh-i-Rustem (276,1), and beneath a cornice profiled in the Greek taste on the Tomb of Cyrus (276,3). As for the crests, they must have had crenelated outlines in the fashion of Mesopotamia, accented by recesses in the faces of the battlements.(276,5,6).

As specimens of the sculptured borders at the sides and below a surface, we find to cite only the bands arranged vertically along the edges of the funerary towers before mentioned ((276,1), and the moulding in ogee form of the base of the Tomb of Cyrus.(276,9).

47 Sometimes Persian architecture, by the refinements of stonecutting or jointing, sought to break the monotony of surfaces. Thus the front faces of the blocks of the wall, that supports the terrace of the Palace of Cyrus, was chiseled to relieve a boss,(271,5), while inversely those of the stones of the frieze of the retaining wall of the terrace of Persepolis were enhanced by a frame (276,8); so again the surfaces of the funerary towers of Pasargade and of Naksh-i-Rustem are distinguished by the singular peculiarity of a regular arrangement of rectangular recesses and of false openings, these being emphasized by the black color of the basalt, forming their enclosure and ground.

The form of Persian doorways contributed to the relief of t the wall in a certain sense. It comprised indeed an architecture in successive planes with a cap in strong movement. This sometimes presented -- witness the funerary towers mentioned -- the appearance of a lintel raised at its ends (276,2), or again -- as seen on the Tomb of Cyrus at Pasargade -- the con-

confused and ungraceful appearance of a series of mouldings e ending with a slope (276,3); normally, this was a high and projecting cornice, whose hybrid model combined with taste and s success the general profile invented by Egypt, the Ionic chaplet of beads and disks being substituted for the banded torus of the Egyptian type, and finally a triple row of lanceolate leaves, rounded off at the ends and edged with a fillet, which replaced the grooves of the Egyptian cavetto.(276,4; 282).

Let us add, that the Persian architect freely resorted to t the sculptor to enhance a surface in relief, as attested by t the fronts of flights of steps, ramps, retaining walls and the jambs of doorways to be seen at Persepolis.

It is necessary to praise the arrangement of Persian porticos, of which a correct idea may be obtained from the facades imitated on the royal tombs of Naksh-i-Rustem (267; 272). The admirable width of the intercolumniations, that may be taken at 5 1/2 diameters, [1] was the more impressive from their contrast with the solidity of the high entablatures, whose height almost equaled a fourth of the total elevation. On the other hand, the customary doubling of those broad galleries produced picturesque plays of light and shade, to which responded those caused by the projection of the architraves and the spaced ends of the beams.

Note 1.

Tomb of Darius	4.9 diams.	= 8.6 ft.
Apadana of Susa	4 2\3	=22.9
Propyleion of Xerxes	5	= 22.7
Apadana of Xerxes	5 1\6	= 23.8
Hall of 100 Columns	5 1\2	= 17.2

III. Effects from Relief of Details.

Nothing better manifests the reality and the tendency of the architectural genius of ancient Persia, than the form imposed on the isolated support. With the fundamental quality of suitability to its function, it associated that of a noble and elegant relief, of a grand character, of an elevated pose enhanced by picturesque details. Certain parts betray a foreign origin; but Persian art interpreted its models with so much freedom and taste, and composed an entirety so original and t tasteful, that its formula is one of the happiest, that men have ever invented.

A primary element of its effect is the slenderness of the s shaft, which we have sufficiently emphasized in our study of construction, and need not return to it. [2] We shall limit ourselves to two remarks; its form is slightly less conical than that of the Ionic shaft, less marked when the capital was simple than when it was compound; [1] its surface might be smooth -- witness the column of the Palace of Cyrus at Pasargade and those represented on the facade of the Tomb of Darius; but most of the time, it was grooved by flutes with sharp edges, whose number varied from 32 to 52; at the lower end of the shaft, this was relieved by an astragal. It had no entasis.

Note 2. See page 403. We may recall that the shafts of the facade of the Tomb of Darius measure 7 1\4 diameters; the shafts of the portico of the ,padana of Xerxes are 10 3\. diameters; the shaft of the column of the Palace of Cyrus at Pasargade is between 10 and 11 diameteеs.

Note 1. Propyleion of Xerxes (compound capital), upper diameter 4.0 ft., lower diameter 5.1 ft.; slope of 0.26 in. per ft.

Apodana of Xerxes, order of the porticos (simple capital), upper diameter 4.5 ft., lower diameter 5.2 ft.; slope of 0.16 in. per ft.

Apodana of Xerxes, order of hall (compound capital), same d diameters as the last; slope of 0.25 in. per ft.

Apodana of Susa, order of porticos (simple capital), upper diameter 4.3 ft., lower diameter 5.2 ft.; slope of 0.20 in. per ft. (Length of shaft restored according to the proportions of the preceding order.

Tomb of Darius, imitated column (simple capital), upper diameter 1.58 ft., lower diameter 1.97 ft.; slope of 0.31 in. per ft.

Persian architecture employed four types of base.

A first one was entirely rudimentary and consisted of a thin disk interposed between the shaft and the ground, of which two specimens are known, one being still in place at Pasargade, a and the other was recognized by Coste at Ecbatana.

A second shows a form dear to Ionia, which is notably illustrated by the order of the Temple of Samos, and may be seen on the portico of the Tomb of Cyrus at Pasargade; a square plinth is covered by a thick cushion, whose convex section is grooved by horizontal flutes (278,1).

Grecian art in its Ionic incarnation in Asia is again recalled by the third kind, specimens of which are in the hall of the Apadana of Xerxes at Persepolis, and that of Artaxerxes M-Mnemon at Susa; upper and lower square plinths support a disk, profiled as a plain torus (278,3).

On the other hand, there is no reason for contesting with Persia the invention of the fourth and most original of these forms, which is that of an inverted bell surmounted by two smaller round cushions, the lower being thick and the upper thin, both having incwrved edges. The surface of the bell was decorated by motives elongated vertically -- sometimes simple grooves producing the appearance of the cogs of a pinion (278,4), sometimes of conventionalized water leaves (278,5) or even repeated lotus stems (278,7). In any fashion the form was a happy one, pleasing the eye and satisfying the mind by reason of the broad base arranged for the shaft. Doubtless it was necessary to see in it an ornamentation of the block of wood or of stone employed for the same purpose by the existing peoples of Sinjar and Mazenderan! (280,4,5).

The order of the Apadana of Xerxes at Persepolis and of that at Susa reserved the base with double plinths and torus for t the columns of the hall, which were terminated by compound capitals, while the bell shape was associated with the simple capitals in the porticos (279); the contrary appeared in the Hall of 100 Columns and on the portico of the Tomb of Darius.

The part taken by the base in the height of the column is r represented by 7 to 8 per cent of the total height.

Meanwhile the capital forms the most tasteful and most characteristic portion of the relief of the Persian isolated support; it is also remarkable in regard to the effect as to that of structural utility.

Its essential element to which it was frequently reduced, h however careful the programme, was a bracket composed by joining a pair of the foreparts of couching animals -- generally kneeling bulls, but also of monsters. On the support offered by their heads rests the architrave, while on the middle of their common body was inserted the transverse girder carrying the supports of the same aisles. By reason of the increase of surface resulting from its oblong shape, and because of the a

appearance and the reputation for strength of the animal represented, as well as by the result of the analogy of the architrave to a yoke, this motive singularly favored the purpose a and the manifestation of the function of support devolved on this member. At the same time the outline of the folded legs facilitated the harmonizing of the dominant horizontal of the bracket with the vertical of the shaft (274; 275; 280,1).

Indeed the relief of the Persian column was suited indifferently to the direct placing of this group on the top of the s shaft, or to the insertion between the two of a very high element -- this is nearly thrice as high as the capital with two heads, and these together usurp nearly two-fifths of the total height. [1] Its very compound form places two parts of equal height on each other; the lower superposes an expanded corolla above the sort of bell decorated by the forms of pendant leaves; the upper one consists of a prismatic pier of square plan, each side being fluted with doubled volutes at top and bottom. (275; 280,1).

On the whole, a cumbrous but not a confused composition, skilfully outlined and with the grandest effect.

In the following fashion has been restored the process of t the invention of the Persian capital. The shape of the mass of the bulls evidently proceeds from the same principle as the bracket cap still employed by the peasants of Mazenderan (280,4) and from the forked one utilized by the Yezidis of Sinjar with two main branches (280,5).

As for the sculptures of the block in the image of bulls with joined backs, besides that it accords with the general taste of the ancients and moderns, it recalls the memory of an E Egyptian idea without actual examples, but of which we possess many representations, that of the heads of lions, gazelles or serpents, appearing to emerge from a bouquet and to support a load (280,2,3; 55). The relief of the pier, whose flutes have the meeit of recalling those of the shaft, presents a singular analogy to that of pieces of carpentry, and particularly to t the support of a ridge represented on a rock-cut facade in Phrygia (145,12), while the motive of the volutes necessarily recalls the preferred element of the decorative repertory of Western Asia of the Phoenicians and Hittites. With the bell we

[illegible]

[illegible] surfaces of the pillars.

[illegible]

[illegible] ry. It is not exact symmetry nor uniformity. At Persepolis, the sides of the terrace were not straight and its surface was not level; each edifice was located without consideration for the positions of the other ones; in the same columns may be combined two types of bases, and two or even three forms of capitals.

It is no less true, that without mentioning their predilection for rectangular outlines, or more particularly square ones, [illegible] of a very lively taste and a very sure sentiment for effects produced by order and rhythm.

And first it pleased them to place in proportion general as well as particular arrangements, by relating them to one of their elements taken as unit. Thus all dimensions of the apadana of Susa are multiples or submultiples of a group of seven slabs of the pavement, the base being equivalent to the sum of [illegible] story of the ratio of the [illegible] of the [illegible]

[illegible] and part of the internal vestibule of the propylaeon Xerxes [illegible]

[illegible] appeared to be essential in Persian art.

Note 1. Pillar of the Tomb of Darius.

height of the base	2 modules.
height of the shaft	19
height of the capital	4
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

necessarily associate the idea of the palm capital of Egypt ((280,7), and as for the bell with leaves, this arouses in the mind of the historian more than one image of capitals fashioned more or less earlier in Assyria, phoenicia and Ionia (280, 9,10,8); or without speaking of the model offered by nature in the falling branches of the palm tree.

IV. Effects of Harmonic Order.

Certainly Persian architecture was not tainted with regularity. It neither imposed symmetry nor uniformity. At Persepolis, the sides of the terrace were not straight and its surface was not leveled; each new edifice was located without consideration for the positions of the older ones; in the same apadana may be combined two types of bases, and two or even three forms of capitals.

It is no less true, that without mentioning their predilection for rectangular outlines, or more particularly square ones, Persian architects have multiplied manifestations indicative of a very lively taste and a very sure sentiment for effects produced by order and rhythm.

And first it pleased them to place in proportion general as well as particular arrangements, by relating them to one of their elements taken as unit. Thus all dimensions of the Apadana of Susa are multiples or submultiples of a group of seven tiles of the pavement, the same being equivalent to the sum of ten bricks. More characteristic still are the relative constancy of the ratio of the height of the Persian column to the diameter of the shaft and the fact, that half the mead diameter of the isolated supports of the facade of the Tomb of Darius and that of the internal vestibule of the Propyleion Xerxes exactly divides the dimensions of those monuments. [1] (281). T This means that alone in all Asian architecture, Persia applied the modulary system, the generator of the "order", which a appeared to us essential in Grecian art.

Note 1. Facade of the Tomb of Darius.

Height of the base	2 modules.
Height of the shaft	17
Height of the capital	4
Height of the entablature	6
Intercolumniation between axes	12
Width of vertical arms of cross	42

Height of upper arm	28 modules etc.
Propyleion of Persepolis.	
Height of the base	2
Height of the shaft	13
Height of the capital	9
Intercolumniation lengthwise	12
Intercolumniation transversely	7
Width of jambs	6, etc.

The monuments of Achemenide Persia reveal a common practice of proportioning by arithmetical or geometrical methods.

Thus the width of the doorway is to its height as 1 to 1 1/2, 2 or 2 1/2; [2] thus again at the Apadana of Susa the depth of the portico is equivalent to 1/6 the measure of the facade of the edifice; itsir length is 2/3, like the side of the hall.

Note 2. These proportions are respectively those of the doorways of the funerary Tower of Naksh-i-Rustem, of the Tomb of Darius, and of the Hall of 100 Columns.

Yet an arrangement of the geometrical kind, based on the properties of the equilateral triangle appears to have obtained the favor of Persian architecture; witness for example,the entirety and the details of the facade of the Tomb of Darius and the equally significant composition of the Propyleion of Persepolis. [3] (281).

Note 3. First of the Propyleion.

If on a sketch of their longitudinal elevation be traced a line from one support to the next in the plane of the joint of the shaft and base, and an equilateral triangle be erected on this, two facts are verified. 1. The apex falls on the line of the tops of the columns; 2. The point in which the sides c cut the axis is in its turn the apex of an equilateral triangle, whose base coincides with that of the large one, measures 2\3 its length, and terminates at one end at one jamb, at the other in the axis of the other column (281,1).

If the operation be repeated on the facade of the Tomb of Darius, it is observed that the triangle in question has its apex at the middle of the upper limit of the tablet, at the moral centre of the composition, the head of Ahura-Mazda, and that the axes of the columns coincide with the altitudes of four equilateral triangles constructed on the base of the larger o one and measuring 2\5 of its length.

41 Let us note in closing, that groups of isolated supports, those of the halls like those of the porticos, reveal a marked preference for two numbers, which in the order of frequency of the number of the columns,are 6 and 4, or 7 and 5, if the intercolumniations are counted. [1] Doubtless it is necessary to s see in this fact a result, both of the use by the Persians of two metrical systems, one duodecimal and the other decimal, a and of the sacred character generally attributed by antiquity to the number 7.

Note 1. At the Apadana of Xerxes at Peesepolis and that of Artaxerxes at Susa, according to the point of view, the portico presents two rows of 6 columns or 7 intercolumniations; the hall has 6 rows of 6 columns or 7 spaces and 7 aisles. The Hall of 100 columns was pierced by 6 times 6 windows.

On the other hand, at the Tomb of Darius are counted 4 columns or 5 intercolumniations; in the portico of the Palace of the same prince at Persepolis are 2 rows of 4 columns or 5 intercolumniations, and in the hall are 4 rows of 4 columns or 5 spaces and 5 aisles. There were 4 columns in the propyleion of Xerxes and 4 doorways to the Hall of 100 Columns.

V. Effects of Ornamentation.

The evidence of the ruins and of the dazzled Greeks teaches us, that the esteem of the Ancient Persian architecture for b beauties of the monumental, sculptured or harmonic order did not exclude a very strong taste for the charm of ornamentation; indeed the legendary luxury of the kings must have given its tone.

The part of the effect due to the use of choice materials in massive form was secondary, produced by the appearance of the cedar and cypress of the carpentry, of the quite ordinary gray marble of the columns, of the diorite and the basalt of the e enclosures of the doorways and the windows, and of certain bases. On the contrary, much was demanded from the facings, the applied work and overlays, and the paintings.

The walls of crude bricks were concealed by a covering of s stucco, a wainscoting of wood, a facing of bricks carefully made and burned, or one of enameled faience. The last consis-
42 ted of an elevation either -- as the case of the "frieze of archers", that decorated one of the Palaces of Darius at Susa,

and now sheltered in the Louvre -- either of long tiles, 13.8 ins. long and nearly 3.5 ins. high,-- or as shown by the "frieze of lions" preserved in the same museum, and cmoning from the Apadana of Artaxerxes Mnemon at the same place -- of blocks about 14.2 ins. long, 10.6 ins. wide and nearly 7.1 ins. h high; the ground is coarse and friable, but the enamel is superb, very adherent and brilliant.

Metal played a great part, used in sheets or leaves; thus t the horns and ears of the bulls of the capitals were attached and gilded parts of bronze; the columns, the beams and wainscoting had plates, sometimes being entirely covered with gold or silver; finally, gilding in many places enhanced the sculptured portions of the ornamentation.

Persian art had a passion for effects of color. Surfaces in burned bricks were varied by the use of bricks differently coored by differences in burning. Stucco was tinted; that covering the walls of the Apadana of Susa was a vivid red in the interior, a gray dove color externally. If we believe Herodotus, the battlements of the first five walls of Ecbatana were respectively painted white, black, purple, blue and reddish-orange; those belonging to the wall next the last were silvered, and those of the final wall were gilded.

Yet the ceramic facings contributed most effectively to the polychromy; their tone in a dominant blue comprised a strong blue and a very soft turquoise blue, a deep yellow and a straw yellow, a hard green and another lighter tint, a purple and a white, the general tone was warmer in the time of Darius, than in the epoch of Artaxerxes Mnemon.

From the simplicity of the patterns and the quiet arrangement of the harmonies, these panels retained a monumental character, while the beauty of the tints, the freedom of the spots, the brilliancy of the enamel, and the skilfully contrasted composition effectively combined in arousing the most vivid impressions of color.

Persian architecture constructed substantially in earth and in wood, and in but limited proportions utilized the resources of ornamental sculpture and of statuary. Yet its capitals, b bases and cornices were carefully wrought; the jambs of the d doorways were decorated by figures in relief (282); it was the

same for certain parts of the retaining walls and ramps of the stairways; at the Propyleion of Persepolis the jambs of the g great portals were cut in representations of human headed bulls 16.4 ft. high and 19.7 ft. long (265); finally the facings of burned bricks were frequently modeled, and the Persian ceramic facings were distinguished from the Mesopolitan by a representation in relief of the persons and the motives (283).

The ornamental repertory of Persian architecture betrays the same eclecticism as the programmes, the structural forms and the monumental relief; but it manifests therein equally a remarkable power of interpreting a model, of realizing alliances and combinations producing novel effects, as well as a very r refined taste, not satisfied by richness without elegance. It drew from three sources of inspiration accessible to decorative art.

A series of geometrical order comprised the ring, square, c circle, and equilateral triangle; the stepped merlon, lance h-head, sawtooth, a row of lozenges, the Assyrian chaplet of disks, rounds and the Ionic egg.(284,3,5,10).

The group of plant motives, essentially composed of elements of invention in Egypt, Mesopotamia and Phoenicia, combined very conventionalized types, several of which were exquisite; s such were the lotus corolla, open or expanded, often repeated as if set within each other (284,2), also frequently aligned and joined by the curve of a common stem, sometimes set at the top of a stalk more or less high(284,6); palmatiums, daisies variously represented; lanceolate leaves bordered by fillets, sometimes erect and sometimes falling (284,7); finally as a g great favorite and very characteristic of Persian decoration, an arrangement of two volutes opposed at each end of a vertical line of junction -- in brief, the equivalent of the cushion of an Ionic capital set on end, or of two shavings raised at both ends of a board. [1] (284,8; 275). Also note a conventional image of a tree outlined like a pineapple, doubtless having a symbolic meaning.

Note 1. See a motive of Phrygian decoration.(145,12).

The part of the animal or human figure was considerable. W Without speaking of the kneeling bulls at the tops of columns under the architraves; on the walls were lions walking, seated,

facing and fighting; monsters, winged griffins and hybrids of bulls and unicorns, recall Mesopotamian friezes; from the banks of the Euphrates and the Tigris even came to act as guards at the portals of the Achemenide palaces the cherubim with bodies of winged bulls, completed by a human head crowned by a tiara. [1] (265).

Note 1. See (88; 79; 73).

Finally, the human form appeared; on the one hand, with the appearance of the sovereign fighting the griffin, walking, or enthroned on a platform supported by the provinces of the empire; on the other, as the soldiers of his guard, the great personages of his court, coming to render homage to the sovereign, and tributaries bringing tributes or gifts (282). The placing of these themes on the retaining walls of the terraces beneath the palaces, on the fronts of the flights of steps, on the ramps and walls of the stairways and on the jambs of the doorways, presented the twofold advantage of emphasizing them, and of illustrating the purpose of these architectural elements.

423 Part II. Roman Architecture.

In 753 B. C. begins the period of nearly eleven centuries f filled by the political history of Rome. But the beginnings of Roman architecture cannot be carried earlier than the 3 rd century B. C. Before that date the future capital of the Mediterranean world was merely a colony of Etruria, and with respect to the art of building, open to Hellenic influences.

424 The area of Roman architecture comprises a domain proper and a region of penetration; besides Rome and Italy, the former c comprises Gaul, Great Britain, the Iberian peninsula, north A Africa, the eastern region of the Balkan peninsula; the second combined Greece, Asia Minor, Syria and Arabia Petrea.

Chapter 1. The Requirements. -- Monumental Chronology and Topography.

I. The Requirements.

No civilization other than the Roman at the end of its formation had more need of constant cooperation in the art of building, and none opened to this a wider and more varied career.

For a long time, the exercise of Roman worship depended little on architecture, since the Latin peoples only adored abstractions, political ideas and human actions, forces and natural phenomena. But from consorting with Etruscans, Hellenes a and Orientals, Rome not only adopted the conception of deities personified, actually present in the sanctuaries consecrated to them, but it also annexed to its own pantheon a portion of those of the peoples conquered by it, so much that it ended by becoming a very good patron of religious architecture.

The Romans neglected domestic architecture even less. More than the Greeks, they had a taste for a comfortable and luxurious dwelling; the desired a country house and a city mansion, and a wealth acquired by the pillage and exploitation of some of the richest countries of the ancient world permitted them this satisfaction.

Whether they practised burial or cremation -- the two methods competed in all ages -- they believed in a comparative survival of the dead in the form of shades (manes), and in the n necessity of providing them with tombs, which were voluntarily made monumental.

Yet these categories of requirements appeared secondary, in

425 comparison with that determined by the Roman conception of the conditions of the national life on the economical, social and political sides.

A primary and important series of requirements resulted from the understanding and knowledge the Romans had of the needs of city life, from their desire to have cities commodious, sanitary and beautiful, provided with good streets, well supplied with pure water, and decorated by monuments.

426 A second followed from the elevated ideas of the Roman amdinistration had of its duties to commerce; it indeed applied itself to supply this with exchanges and markets suited for all business on a large scale; with well equipped harbors, docks, abattoirs, granaries, roads and substantial bridges, that further was a condition necessary to the government, for the policing and defense of an immense empire.

A third was imposed by the necessity of ensuring the action of the political, judicial and administrative institutions of Rome and of the provinces; these required comitias for the meetings of organized bodies, and basilicas for the tribunals.

The dependance of Roman society upon architecture was singularly increased, from the fact that it took under its charge the comfort and pleasure of the people; the custom of bathing daily, contracted in the 3 nd century B.C.; the purpose of gratifying the citizens by walks and by places suited for physical exercises; to amuse them by shows, by scenic dramas, by h horse races, by combats of gladiators, by hunts and fights with ferocious beasts; finally the public exhibition of the artistic booty of the campaigns in Greece and the East, with the preservation of the literary treasures of the same origin, created an enormous need of bathing establishments, public squares, gardens, porticos, palestras, theatres, circuses, amphitheatres, galleries and libraries.

To the immense needs represented by the fulfilment of so many requirements, so varied and frequently very important, was again added for Roman architecture, that of satisfying by the creation of commemorative monuments the desire possessed in t the highest degree by the Romans for perpetuating the memory of individuals and the records of the nation.

The number of the works of public interest was the more con-

considered ... that whether ... of material, the ... stone was ... constructions, ... deities were ... in ... and ... by a policy of ... provincial ... and municipal autonomy; finally, private initiative ... to the government ... and generous competition. Indeed it was not rare for even the very onerous cost of a structure at Rome or ... by a ..., ... from a festival occasion, and in other cases by a prominent citizen, either led by civic ... [illegible] ... to become noted.

After all the causes of architectural requirements just mentioned, it is proper to mention that resulting from the frequency and the violence of the conflagrations at Rome. 1

[illegible]

[illegible] ... 22 and 23 A.D., ... 27, 65 (under Nero), ..., 191, 247 ... [illegible]

[illegible]

[illegible]

The last century of the royal epoch (?-510) was occupied by the reigns of Tarquin the Elder, of Servius Tullius and of Tarquin the Proud, and it was marked by several notable undertakings [illegible] ... of sewers, the construction of a wall, a ... the erection of the temples of Vesta and of the Capitoline Jupiter. ... and viewed from our standpoint, the two centuries following the expulsion of the kings seem to be ... [illegible] ... of peasants, and the architecture ... narrow; besides that every ... was devoted to political struggles and to wars, which were ... defensive and uncertain.

2. From the end of the 4th century to the middle of the 2nd century B.C.

Toward the end of the 4th century B.C., the senate were ... for conquest over the Latins, Etruscans, ..., Samnites and Gauls ... turned out to ... advantage. [illegible]

considerable, that whether republican or imperial, the Roman state was rich in contributions, booty and tributes; the cities were encouraged in municipal and sumptuary expenses by a p policy of broad provincial decentralization and municipal autonomy; finally, private initiative brought to the government an ardent and generous competition. Indeed it was not rare for even the very onerous cost of a structure at Rome to be provided by a general, returning from a fruitful campaign, and in other cities by a prominent citizen, either led by civic devotion, an ambition for municipal honors, or simply the desire to become noted.

After all the causes of architectural requirements just mentioned, it is proper to mention that resulting from the frequency and the violence of the conflagrations at Rome.[1]

Note 1. Without speaking of the burning of Rome by the Gauls in 390 B. C., note the great fires destroying entire quarters in 208, 52 and 36 B.C., in 27, 65 (under Nero), 80, 191, 237 and 283 A.D.

II. Monumental Chronology and Topography.[2]

Note 2. Italics in the original text distinguish the monuments still in existence.

The last century of the royal epoch (616-510) was occupied by the reigns of Tarquin the Elder, of Servius Tullius and of Tarquin the Proud, and it was marked by several notable undertakings for municipal, military or religious purposes; the creation of bridges and of sewers, the construction of a wall, a and the erection of the Temples of Vesta and of the Capitoline Jupiter. On the contrary and viewed from our standpoint, the two centuries following the expulsion of the kings seem to be vacant. The people were rude, the bulk of the population being composed of peasants, and the aristocracy was avaricious and narrow; besides that every energy was devoted to political struggles and to wars, which were often defensive and uncertain.

1. From the End of the 6 th Century to the Middle of the 2 nd Century B.C.

Toward the end of the 4 th century B.C., the secular wars maintained by Rome for supremacy over the Latins, Etruscans, Sabines, Samnites and Gauls decidedly turned out to her advantage. At the same time the political equality secured by the

plebeians ended the long period of conflicts and troubles. A new era opened for the triumphant and pacified city, thenceforth free to extend its horizon and to increase its ambitions. In 312 the censorship of Appius Claudius, a superior man, inaugurated great public works to illustrate Roman civil engineering by realizing the first road anf the first aqueduct (Via Appia and Aqua Appia). From 303 to 292 were built at least five temples, and finally in 284 the abandonment of the system of roofing with small boards announced a development of the p programmes and of architectural expedients in accord with the progress of luxury, implied by the contemporary substitution of a vessel of silver for one of pottery.

These tendencies were singularly strengthened in the course of the 3 rd century and during the first half of the 2 nd, on the one hand by the submission, completed in 266, of Italy to the Roman power, on the other by the knowledge of Hellenic civilization, which caused from 280 to 168 the wars against Tarentum, against the Carthaginians in Sicily, Philip of Macedon, and Antiochos of Syria in Greece and Asia Minor. The end of the 3 rd century and the first third of the 2 nd were marked by the execution of public works -- the paving of roads, construction of bridges, of useful edifices like docks and basilicas; of a circus; of very numerous temples, even of monuments without any purpose other than to adorn the city. [1] The Sarcophagus of Scipio Barbatus, preserved at the Vatican, manifests the importance of funerary requirements at about the middle of the 3 rd century.

Note 1. Paving of Appian Way (188); construction of Bridge Emilius (184); of the Docks of Emilius (192); Basilicas Portia (184), Fulvia (179), Emilia (176), Sempronia (169); Circus of C. Flaminius (221); Temples of Spes (254), "Vesta"(215), "Fortuna virilis"(214), Vesta (210), Juno Sospita (197), of the Great Mother (192), Venus (184), Pieta (191-181), Juno Queen, (178); Arch of Stertinus (196).

2. From the Middle of the 2 nd Century to the End of the Republic (27).

The erection in 147 on the Campus Martius, by the care of Q. Caecilius Metellus, of a marble portico may appear to inaugurate an epoch of architectural requirements in accord with the

by the destruction of Carthage, the reduction of Macedonia to a province, and the establishment of a protectorate over Greece. But progress was opposed by the political convulsions succeeding for more than a century, from the tribunate of Tiberius Gracchus to the principate of Octavius (133-27). Still, during the first quarter of the [illegible] century, before the revolutionary attempt of Caius Gracchus and the civil war, there were erected [illegible]. A basilica and a portico, and two temples were [illegible].

[illegible] Temple of Concord (121) and of [illegible]

The reconstruction by Sulla of the Temple of Fortune at Praeneste (82-78), the construction of the Tabularium (Archives) in 78, the construction in 72 of the Temple of Vesta at Tivoli and the [illegible] of Hercules at Cori, are the sole manifestations of [illegible]

[illegible] and Caesar (44).

From 62 to 44, particularly due to the initiative of Caesar, [illegible]

[illegible] Theatre of Pompey, the first one built [illegible]

[illegible] all three commenced in 54; Amphitheatre of C. Scribonius Curio (50). Temple of Venus Genetrix (46); Curia Julia [illegible]

[illegible] Julius, and Forum of Augustus [illegible]. After [illegible] to the struggles ending in the triumph of Octavian [illegible] a restoration of the Regia (36) [illegible] which was continued in 36 with the construction of a Temple of Julius Caesar, [illegible] in 29, followed in 32 by that of the Portico of [illegible], and in [illegible] by that of the [illegible] of [illegible].

The embellishment of Rome [illegible] by the pillage and exploitation of the conquered countries [illegible] relative affinity to the [illegible]

[illegible] in luxury, determined a rapid flight in domes-

rank as a world power to which Rome was promoted the next year by the destruction of Carthage, the reduction of Macedonia to a province, and the establishment of a protectorate over Greece. But progress was opposed by the political convulsions succeeding for more than a century, from the tribunate of Tiberius G Gracchus to the principate of Octavius (133-27). Still, during the last quarter of the 2 nd century, between the revolutionary attempt of Caius Gracchus and the civil war, there were erected an arch, a basilica and a portico, and two temples were rebuilt. [1]

Note 1. Fabian Arch on the sacred way; Basilica Opimia (121); Portico Minucius Vetus (110); Temples of Concord (121) and of Castor and Pollux (117).

The restoration by Sylla of the Temple of Fortune at Preneste (83-78), the undertaking of the Tabularium (Archives) in 78, the construction in 72 of the Temple of Vesta at Tivoli and t that of Hercules at Cori, are the sole manifestations of a notable architectural activity in the course of the half century preceding the establishment of the triumvirate of Pompey, Crassus and Caesar (60).

From 62 to 42, particularly due to the initiative of Caesar, were produced some important edifices; Temple of Minerva on t the Campus Martius (62), Theatre of Pompey, the first one built of stone (55); Forum Julium, Basilica Julia and Basilica Emilia, all three commenced in 54; Amphitheatre of C. Scribonius Curio (46), Temple of Venus Genetrix (45); Curia Julia for the sittings of the senate (44-29); Temple of Saturn, Temple of Divine Julius, and Forum of Augustus (42). After a relaxation corresponding to the struggles ending in the triumph of Octavius -- however noting a restoration of the Regia (36) -- production was resumed in 33 with the construction of a Temple of Julius Caesar, completed in 29, followed in 32 by that of the Portico of Octavius, and in 30 by that of the Amphitheatre of Statilius Taurus.

The enrichment of Roman society by the pillage and exploitation of the conquered countries, its relative affinity to the school of Hellenism, and finally the rivalry of the great families competing in luxury, determined a rapid flight in domestic architecture. From the beginning of the 1 st century rose

[illegible] with the forms of palaces, such as those of Crassus [illegible] and of Lepidus, which were counted by hundreds fifty [illegible].

[illegible]

on the [illegible] -- [illegible] dates from the year [illegible] -- indicates [illegible] the development taken by the liberty movement.

6. Imperial Epoch. (27 B.C. to 4 th century A.D.).

[illegible]

[illegible] desired [illegible], [illegible] a [illegible] of wealth, [illegible] monuments for the public [illegible] as well as for private purposes. Those of [illegible] many of which were [illegible], who made the conception and direction of [illegible] their affair, their erection being by their freedmen or by the proper officials.

As for [illegible] of a private character, their number and [illegible] [illegible] in consequence of an extreme development of [illegible] wealth, of the formation of immense private fortunes, and finally of an entire [illegible] of Roman society or [illegible]

[illegible]

[illegible]

[illegible] undertakings, whose list is long, and also to [illegible]

[illegible]

[illegible] to his friends or favorites, [illegible] (27 B.C.- 14 A.D.) could boast of "having left a city built of marble, which he [illegible]."

All kinds of architecture were put under contribution for [illegible] [illegible]

the construction of bridges, sewers and aqueducts (rebuilding in stone [illegible]); for the arrangement of squares with colonnades (Forum of Augustus or Mars, inaugurated in the [illegible]

[illegible]

of [illegible] (10 B.C.); for the erection of theatres, theatre of [illegible], of [illegible] (11 B.C.); for the erection of numerous [illegible] temples; to Apollo on the Palatine (28 B.C.), to the [illegible] deities of the family of Julius (Pantheon, 27 B.C.), to Mars in the centre of the Forum of the Augustus (2 B.C.), to Castor and Pollux (6 A.D.), to [illegible] at the

mansions with the forms of palaces, such as those of Crassus 431 (died 91) and of Lepidus, which were counted by hundreds fifty years later.

The Tomb of Caecilia Metella, wife of the triumvir Crassus, on the Appian Way -- it dates from the year 60 -- indicates t the development taken by the funerary monument.

3. Imperial Epoch. (27 B.C. to 4 th Century A.D.).

The empire brought numerous needs to Roman architecture. A rare prosperity resulted from peace, order and a rapid circulation of wealth, and permitted ample and constant demands for the public interest as well as for private purposes. Those of the first kind came largely from the Caesars, many of which w were enthusiastic builders, who made the conception and direction of great undertakings their affair, their erection being by their freedmen or by the proper officials.

As for demands of a private character, their number and importance increased in consequence of an extreme development of 432 general wealth, of the formation of immense private fortunes, and finally of an entire permeation of Roman society by Hellenistic and Asian civilizations.

The founder of the empire furnished the example. Thanks to his own undertakings, whose list is long, and also to those a assumed by his best lieutenant Agrippa, and to those he suggested to his friends or favorites, Augustus (27 B.C.- 14 A.D.) could boast of "having left a city built of marble, which he had found built of bricks".

All kinds of architecture were put under contribution for t the restoration of the ancient monuments destroyed, and for t the construction of bridges, sewers and aqueducts (rebuilding in stone the Bridge Sublicius); for the arrangement of squares with galleries (Forum of Augustus or Mars, inaugurated in the year 2 B.C.); of porticos, Portico of Argonauts (26 B.C.), Portico Vipsana (7 A.D.); for the installation of baths, Baths of Agrippa (19 B.C.); for the erection of theatres, Theatre of Balbus, of Marcellus (13 B.C.); for the erection of numerous consecrated temples; to Apollo on the Palatine (28 B.C.), to the ancestral deities of the family of Julius (Pantheon, 27 B. C.), to Neptune in the centre of the Portico of the Argonauts (26 B.C.), to Castor and Pollux (7 B.C.), to Mars Ultor at the

back of the Forum of Augustus, to Concord (10 A.D.), to "Vesta"
on the Forum Boarium; for the erection of an imperial Mausole-
um on the Campus Martius (27 B.C.) and of commemorative monum-
ents (Arch of Augustus on the Forum (29 B.C.), Altar of Peace
(9 B.C.).

At the same time domestic architecture prospered, favored by
the prince (House of Augustus on the Palatine), and by the gr-
eat men.

Equal ardor greatly failed to animate the successors of Aug-
ustus belonging to his family. Aside from the important publ-
ic works (Aqueduct of Claudius, Harbor of Ostia) and a Triump-
hal Arch in honor of Tiberius (16 A.D.), a Temple under the
name of Claudius, commenced in 39 and completed in 69, offici-
al demands were almost lacking between the years 14 and 68 A.D.

On the contrary, the demand for palaces (Palace of the Tiber)
on the Palatine, Golden House of Nero (65-68) and for mansions
(Gardens Lamiani, Maiani, Sallustiani --) was as considerable
by the importance of the programmes as by the number of examp-
les.

The conflagration imputed to Nero, that ravaged Rome in July,
65, was the more favorable to the interests of architecture,
because for a century and a half the holders of imperial power
(Flavian, Antonine and Africanus emperors) had in a high degr-
ee a taste for building, and several distinguished themselves
by a real sentiment for art.

Vespasian protected the artists, is entitled in an inscript-
ion the "restorer of temples", rebuilt that of Capitoline Jup-
iter (74), paid the cost of a Forum and Temple of Peace (75),
and commenced the Flavian Amphitheatre, better known under the
name of Coliseum, which Titus was to finish (80) and Domitian
to perfect (82). The brief reign of the former (79-81) was o
only marked by the erection of Baths northeast of the Coliseum,
and by that of a Palace.

On the contrary, the principate of the second renewed the g-
glorious traditions of that of Augustus. Rome was covered by
work-yards, not only with a view of repaining the injuries ca-
used by the great fire of the year 80, but even for the creat-
ion of new monuments. In fifteen years were realized superb
Temples dedicated to Capitoline Jupiter (82), Vespasian, Janus,

Isis and Serapis, a Forum called Transitorium or of Nerva; a Triumphal Arch in honor of Titus, a magnificent imperial Palace (House Flavian), and a Stadium (Piazza Navona).

In the provinces as at Rome, architecture had equally to praise the epoch of the Antonines.

Trajan required from it, besides an Aqueduct, an interior Port at Ostia and Baths, which he located in the vicinity of those of Titus, a Triumphal Arch on the Appian Way near the Gate of Porta Capena, which was appropriated by Constantine; a magnificent entirety composed of a Forum enclosed by a double portico and accessible by a gateway of honor, a Basilica n named Ulpian, a court between two buildings for archives, placed in its midst being a lofty Triumphal Column.

Hadrian was himself acquainted with the art of building, and attached his name to a reconstruction of the Pantheon (121-124) and of the Temple of Neptune (136); to the erection of a grand and superb Temple of Trajan in the centre of a court with galleries connected with the Forum of his predecessor; to the realization from his own plans of a magnificent Villa at Tivoli (127-134), and of a Temple of Rome and Venus on the Roman Forum (121-135), one of the wonders of Rome in the judgement of Ammianus Marcellinus; to the erection of an enormous Mausoleum (Moles Hadriani) for his burial and those of his successors, which was transformed into a fortress in the middle ages,and bears the name of the Castle of S. Angelo; finally to the construction of a Bridge over the Tiber, the Bridge Aelius, giving access to that monument.(136).

Under Antonine and Marcus Aurelius, the series of imperial demands was continued by those of a Temple consecrated to the divinity of Antonine and Faustina (141), of a Column -- destroyed -- to the glory of the first of these princes, and of three monuments in honor of the second; a Column (after 161), s still standing, a Triumphal Arch and a Temple, both of which have disappeared.

The terrible conflagration of 191 prepared the work for the architects contemporary with Septimus Severus and Caracalla ((193-217). These emperors further did not limit themselves t to restorations and reconstructions. They actively employed themselves in developinm the monumental decoration of Rome.

The Temple and Atrium of Vesta were restored (205-210), and
there were seen to arise an Amphitheatre termed Castrense, a
Triumphal Arch, commemmorating the triumph of the first of th-
435 ese emperors (203), a colossal water Palace termed Septizonium,
an Arch on the Forum Boarium, known under the name of Arch of
the Goldsmiths (204), and finally one of the masterpieces of
Roman art, the Baths of Caracalla (212-216).

Then the demands became scarcer, opposed by a regime of military anarchy and by the increasing necessity of defending the frontiers of the empire. During two-thirds of the century succeeding the opening of the Baths of Caracalla, monumental Rome was scarcely enriched by an enclosure of the city walls and a Temple of the Sun on the Quirinal, both works of Aurelian (270-275). It was slightly more favored during the following half century; it owed to Diocletian Baths (306) rivaling those of Caracalla; to Maxentius a Circus; to that prince and to Constantine a Basilica (310-312), which was a marvel of construction (326); to Constantine alone Baths and a Triumphal Arch (315), indeed composed of the spoils of another, erected to the memory of Trajan, and which marked the end of the architectural h history of Rome.

436 Yet to the requirements o the metropolis during the entire
empire responded a provincial demand, which rivaled it in certain places and in certain epochs.

For the time corresponding to the principate of Augustus and of his family, an inventory of the monuments still remaining would enumerate works of such great artistic value as the Temple of Minerva at Assizi; Temple of Augustus (Maison Carree) at Nimes (4 A.D.), Temples of Rome and of Augustus at Pola and at Ancyra; the edifices of Aosta and of Pompeii; the Arches at Rimini and Susa; the Arch and Theatre at Orange; the Pont du Gard or Aqueduct of Nimes etc.

It was in the time of the Antonines, that the prosperity of the empire attained its climax. The vitality and wealth of t the provinces were manifested by an admirable flourishing of monuments in the course of the 2 nd, and in a lesser degree, during the 3 rd century. Public works and municipal programmes, private buildings, theatres, amphitheatres, temples, tombs, honorary or memorial edifices, were conceived and realized in

abandance, sometimes at a scale and in a style, which would h have made them worthy to appear in the capital.

To restrict ourselves to some examples, we will cite in Italy, the Amphitheatres of Capua, of Pozzuoli and of Verona; the Arch of Trajan at Beneventum (115); in Spain, the monuments of Merida, the Aqueduct of Segovia, the Bridge of Alcantara over the Tagus (98-106); in Gaul, the Amphitheatre of Nimes and that of Arles, the Arch and the funerary Monument of S. Remy, t the Gate of Arroux at Autun; in Great Britain, the Wall of Hadrina; at Athens, a "Hadrian's Quarter" announced by a Triumphal Arch, the Olympeion and a Library; in Asia Minor, numerous edifices, the Trajaneum at Pergamus, Gate of Hadrian at Adalia etc.; in central Syria, a magnificent series of streets and t triumphal squares, bordered by porticor, theatres, baths, temples, arches, that compose cities like Suweda (103), Bosra (N (Nova Trajana Bostra) -- (about 150), Atil (151), Kanawat, Musmiye (Phaenos), Suleim (Neapolis); another and equally charming series is presented in Syria beyond Jordan by Djerach (Gerasa), Amman (Philadelphia), Palmyra, Baalbec (Heliopolis); in Arabia by Petra; finally in Tunisia, the structures of Dougga (Thugga), of Sbeitla (Sufetula), and of El Djem (Thysdrus), p possessing an Amphitheatre scarcely inferior in dimensions to the Coliseum; in Algeria, those of Lambese, Tebessa, Constantine and especially of Timgad (Thaumamadi), etc.

Evidences of constructive activity in the provinces at the beginning of the 6 th century are; Palace of Diocletian at Spalato (Salone); the edecifes of Treves, then capital of Gaul and an imperial residence, especially the Basilica, conceived on the scale of that of Maxentius; the funerary monument of I Igel; various Ryrian buildings.

— Chiliarchus. — [illegible]. — [illegible].

[illegible] a [illegible] to [illegible] degree; [illegible] to [illegible] formulas, [illegible]; an intense and profound sense of unity and of [illegible], a sincere belief in a vast national superiority, and the absolute conviction, that there should be a [illegible] subordination of the individual to the whole, of the worker to the work, and of art itself to the end sought.

Such a conception is in large measure aesthetic. It [illegible] [illegible] of [illegible] centered on [illegible], and [illegible] from the [illegible] [illegible] pecially from the [illegible] attitude to performance and to success, in order that aiming at that entire perfection, which was the ideal of the [illegible]. On the contrary, it requires one to [illegible] only the [illegible] and [illegible], to have no purpose other than to satisfy any function of private or public life with the [illegible] [illegible] for the accomplishment, strongest and most [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and [illegible] [illegible].

[illegible] [illegible] from a work, [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] by [illegible] [illegible] [illegible] [illegible]

The [illegible] [illegible] [illegible], [illegible] [illegible] [illegible]

[illegible], and [illegible] [illegible] [illegible] [illegible] [illegible] on the [illegible], or [illegible] [illegible] [illegible] [illegible] [illegible] [illegible], the [illegible] and

scientific [illegible] administrative activity, [illegible] [illegible] [illegible] [illegible] [illegible] and [illegible] [illegible].

Chapter 2. Human, Natural and Technical Conditions. -- Influences. -- Schools. -- Epochs.

I. Human, Natural and Technical Conditions.

The Roman temperament had as characterirtics a rare energy, an intelligenee of mediocre extent, ready to adopt formulas, but clear and methodical; an innate and profound sense of authority and of discipline, a sincere belief in a vast national superiority, and the absolute conviction, that there should be a strict subordination of the individual to the whole, of the worker to the work, and of art itself to the end sought.

Such a disposition is in large measure antiartistic. It forbids in particular the regarding architecture in itself ar a source of disinterested enjoyment, of expecting from the intervention of persons of genius the creation of novel effects, especially from becoming attached to refinements and to shades, in brief from aiming at that entire perfection, which was the ideal of the Greeks. On the contrary, it requires one to esteem only the useful and the practical, to have no purpose other than to supply any function of private or public life with the organ most appropriate for its accomplishment, strongest and most durable, to attain this by ways most practical, shortest and most economical.

In fact, the Romans saw in the architect merely an instrument and in his art only a means, just a government machine, when official undertakings were concerned. In that respect, nothing is more significant, than the constant omission of the name of the master from a work, and the no less regular association with this of the name of the magistrate or of the prince, who had charge of its execution.

The realization of the programme, the completion of the structure exhausted the interest taken by the Roman to such a point, that it occurred to him to neglect dressing the exterior! The project comprised an ornamentation, which was separately conceived without any intimate relation to the structural forms, and which was applied on them like a garment on the body, or a mask on the face. Indeed on the one hand, the number and enormous sizes of the works, and on the other, a rapidity characteristic of Roman administrative activity, formed an obstacle to minute care and esthetic refinements.

[illegible] of the [illegible]
[illegible] in [illegible] of the [illegible] [illegible] [illegible] [illegible] to [illegible] [illegible] [illegible] [illegible] to [illegible] a [illegible] [illegible] with [illegible].

[illegible] we shall have to take account of [illegible] making a study of [illegible].

[illegible] the [illegible] [illegible] by its [illegible] [illegible], of [illegible] [illegible] [illegible] of [illegible] [illegible] the [illegible] of a great [illegible] [illegible] [illegible] and [illegible] with [illegible]. [illegible] were [illegible] frequently call [illegible] [illegible] and Africa. In fact, with the [illegible], the art of [illegible] was aristocratic or princely, and [illegible] great [illegible].

[illegible] several peculiarities [illegible] temperament [illegible] [illegible] to the development of [illegible] [illegible] [illegible], [illegible] practice of these [illegible] of the art of [illegible], [illegible] the [illegible] of the [illegible] and [illegible] [illegible].

[illegible], the Roman [illegible] [illegible] [illegible] [illegible] of [illegible] [illegible] [illegible] [illegible], that [illegible] [illegible], [illegible] [illegible] in [illegible], with [illegible] [illegible] [illegible]; that they knew what they desired, [illegible] their [illegible], and [illegible] [illegible] the [illegible] [illegible] [illegible]. [illegible] in [illegible] and in [illegible], they [illegible] a [illegible], not by a progressive [illegible] of parts [illegible] [illegible] and [illegible], but by the collective and [illegible] [illegible] of an organic [illegible], [illegible] [illegible] [illegible] and [illegible] [illegible].

[illegible] that [illegible] [illegible] [illegible] of an [illegible]. [illegible] the [illegible] of its [illegible], but they were also [illegible] for [illegible] economy in material and workmanship.

The practical turn of the Roman mind necessarily allowed a tendency to fix art in recipes. This could only be increased by the methods of execution in public architecture, and which we shall explain later (pages 440-441), and likewise by a very frequent necessity to operate in new countries, badly supplied with trained workmen.

In the number of traits of the Roman character from which a architecture might suffer, it is necessary to count a certain variety of upstart, desirous to exhibit his greatness and wealth; we shall have to take account of this in making a study of the effect.

Finally, let us note that Roman architecture was deprived of the advantage possessed by its Hellenic predecessor, of developing itself in the midst of sympathies and the useful control of a great public; sensitive to art matters and endowed with taste. At Rome the plebeians were rude; frequently half barbarous in Gaul, Spain and Africa. In fact, with the Romans, t the art of building was aristocratic or princely, and in great measure, official.

If several peculiarities of the Roman temperament were opposed to the development of a brilliant national architecture, on the contrary, others were very favorably conditioned for t the practice of those parts of the art of building, that concern the realization of the programme and the construction.

And first, the Roman monuments give the impression, that their authors participated in the breadth of aim, that clarity of views, that sequence in ideas, that genius in organization, that decision in supervision, which explains the fortune of Rome; that they knew what they desired, matured slowly their projects, and never experimented after the work-yard was opened.

Skilful in foreseeing and in providing, they elaborated a p programme, not by a progressive grouping of parts regarded successively and separately, but by the reflective and united conception of an organic whole, methodically distributed into coordinated and subordinated elements.

Equally removed from stinginess and waste, they spared nothing, that could contribute to the utility of an edifice, to i its stability or its beauty, but they were also on the watch for every economy in material and workmanship.

Their methods were simple, and they were always ready to vary them to suit the conditions and circumstances. They applied themselves and understood how to make the most of the materials and to obtain from the artizan the maximum result, thanks to a rational division of the work, and to a method of distinguishing in a structure between a small number of members wrought by skilled workmen, and merely filling parts, which c could be executed by laborers.

From its conception to its completion, a Roman architectural undertaking war subjected to a rigorous material and moral discipline. The work dominated the workman to the point, that carried out by a Grecian master, it was no less stamped with a character completely Roman.

Indeed the plans and specifications were prepared with precision, and the work was carefully superintended during its course, being verified after its completion by an authority specially appointed for that purpose. [1]

Note 1. Under the republic, the procedure for an official undertaking was the following. A decree of the senate assigned its direction to a magistrate, consul, censor, duumvir, etc.; besides a plan the architect prepared a model, when it only c concerned a monumental work, and he furnished a descriptive specification and estimate, which once accepted, became a law for the execution of the work. The works were done by contract. The contractors gave real estate as security, and received one half the fixed sum at the opening of the work-yards. After completion was a strict acceptance. Under the empire, the conduct of the undertaking was entrusted to a curator, chosen by the emperor or by the magistrate of the city, according to the origin of the requirement.

Private construction was regulated by very precise legislation, which related to even the details of construction, fixed the commissions and the responsibilities. Regulations of the public streets determined the restrictions of alignment, height, etc.

Likewise the individuality of the artizan was absorbed in t the lists of working equipment, and the special tradesman in the unit of the work-yard.

To that coordination of effort, to the arbitrary classifica-

[illegible]

[illegible]ification of [illegible], in order to [illegible]
[illegible]
power, not only of emperors were [illegible] a multitude of monum-ents, magnificent under the touch of a thousand years, but also of as many buildings in the most distant provinces as in the capital: in Asia and Africa, connected [illegible] as in those of an ancient [illegible] on the [illegible] of the [illegible] as on the frontier of Germany.

[illegible] base, labourers, [illegible] and [illegible]. The profession of an [illegible] if not honored, it was at least esteemed [illegible] of the [illegible]. A [illegible] of a [illegible] from Traj-[illegible] century A.D., [illegible], which did not a [illegible]

[illegible] at [illegible] of [illegible] the labourers, of [illegible] subject to requisition, slave-[illegible], and [illegible] in the provinces: the [illegible] more [illegible] not only [illegible] but also [illegible], by [illegible] only a single [illegible], the [illegible] of [illegible] Hadrian [illegible], whose [illegible] were at [illegible].

On the other hand and [illegible] by their practical sense, the [illegible]
[illegible]
[illegible] a [illegible] from the beginning.

[illegible] the necessary, [illegible] a [illegible] for [illegible] collected, [illegible] be the most [illegible], to such a point, that [illegible] could not [illegible] of these [illegible] to have been employed[1]

Note 1. For example, this was the case for the [illegible] for

[illegible]

[illegible] with columns of marble and of granite, [illegible] at the centre, and [illegible] before the entrance, were required at times of [illegible]. Two rooms [illegible]
[illegible]

classification of capacities, in brief to that military organization of the architectural undertaking, the Romans owed the power, not only of erecting very rapidly a multitude of monuments, magnificent under the test of a thousand years, but also of as easily building in the most distant provinces as in the capital; in new and scarcely conquered countries as in those of an ancient civilization; on the confines of the Sahara as on the frontier of Germany.

In truth, Roman architecture was liberally supplied with masters, laborerr, eesources and materials. The profession of an architect supported its practitioners, and from the last times of the republic, if not honored, it was at least esteemed equal to that of the physician. A passage of a letter from Trajan to Pliny the Younger attests at the beginning of the 2 nd century A.D., that there was not a province, "which did not p have men possessing experience and talent". In the succeeding century, Alexander Severus established schools and Constantine followed his example.

Official architecture disposed at pleasure of experienced f free laborers, of professionals subject to requisition, slaves, levies, and finally of legionaries in the provinces. The last were recruited from not only unintelligent laborers, but also from skilful workmen, as attested by citing only a single proof, the creation of Timgad by the 3 rd Legion Augusta, whose general quarters were at Lambese.

On the other hand and guided by their practical sense, the Romans never conceived an enterprise, however considerable, w without a large endowment assured from the beginning.

Now they saw grand things, voluntarily realized the useful beyond the necessary, had a weakness for the colossal, attended to the most modest programmes, to such a point, that posterity could take certain of their markets to have been temples! [1]

Note 1. For example, this was the case for the Market for beans and fish at Pozzuoli. The ruins of a rectangular court enclosed by porticos with columns of marble and of granite, w with lateral stalls, a chapel with perstyle at the centre, and a columnar portico before the entrance, were regarded as those of a sanctuary of Serapis. Two rooms provided with stone benches with holes passed for places for the escape of hot vapors. These were latrines!

Their technical means were considerable. Masters of the Mediterranean world, they were benefited by the mechanical inventions of the ancient East and of Greece, as well as the science of Alexander.

We shall not delay to examine the natural conditions found by Roman architecture, since we have previously defined those peculiar to the Eastern part of its area and to the domain of Etruscan civilization. (See pages 154, 159, 256).

With regard to the supply of materials, the situation of Rome was very fortunate; at the site or in its vicinity were easily procured excellent brick clays; a coarse volcanic tufa of greenish gray color (white peperine); a porous and yellowish gray limestone of medium hardness and supporting loads well; (tiburtine travertine); another of reddish color, called stone of Gabies; volcanic sand, the essential element of the famous Roman cement; finally, the Apennines furnished timber. Thanks to the Tiber, which gave access to the sea, it had every facility for placing under contribution Tuscany for its stone of Luna and its timbers of great length; Pozzuoli for its volcanic sand (pozzolana); Gaul, Numidia and Greece for marbles; Syria and Egypt for their hard stones. In Gaul, Spain and Africa was an abundance of good stone, marbles and woods.

The climate of the country in which was exerted the activity of the eastern Roman school was a cause of its progress. It comprised indeed more variety, than that taken into account by the art of building in Greece and the East; less heat, more h humidity, and in certain provinces rigorous cold and snow. [1] It suffices to state that Roman architecture was compelled to an effort at adaptation, to which its Hellenic and oriental r rivals were not forced.

Note 1. At Rome the annual rainfall amounted to even 40 ins. It appears -- we borrow the remark from Lanciani (Remains of Ancient Rome, page 8) -- that ancient Rome had more rigorous winters than modern Rome. At least what induces this belief is the mention made by Denys of Halicarnassos of a tempest of snow, that covered the earth with a layer seven ft. deep, and by Titus Livius of a freezing of the Tiber in 401 B.C. In 271 the Forum was covered by snow for forty days; in 67, a sitting of the senate was adjourned on account of the cold; in an ode

of Horace and a text of Martial are mentions of rigorous winters.

II. Influences. -- Schools. -- Epochs.

One of the most energetil factors of the military and political success of Rome was a thoughtful method of appropriating for itself every quality and every technical superiority recognized among other peoples. This system was applied in the domain of the art of building, as in those of war and of administration. For such reasons Roman architecture appeared as a combination of borrowings and of compromises, like a conclusion of the architectural attempts of the ancient world.

And first from Etruria Rome derived at the same time as its primary civilization, the plans of its houses and of its temples (Tuscan proportions), as well as the essential elements of its construction, the arch and the vault.

Then it exploited Hellenic acquirements, which were revealed to it in the second quarter of the 3 rd century B.C., when it conquered southern Italy and Sicily; it knew these better in the second half of the 2 nd century in the cousse of its campaigns in Greece against Philip of Macedon and in Asia Minor against Antiochus; finally after the reduction of Achaia to a Roman province (146), it was "conquered" by its new subjects. Thenceforth was an invasion of Hellenic architects; when about 146, Q. Caecilius Metellus erected a portico, which inaugurated in the capital luxurious construction in marble, he employed a Greek, Hermodoros, native of Salamine in Cyprus; Greeks likewise were Scauros and Batrachos, the favorite architects of Augustus, and also that of Trajan, Apollodoros of Damascus, the author of his Forum. Indeed, if we credit that prince in writing to Pliny the Younger, it was "proper for architects to come from Greece". And with them came the formula of the Grecian orders, the Hellenic and Hellenistic ornamental repertory, and likewise the theoretical and practical treatises compiled by Latin writers on art, in works of which Vitruvius presents a specimen.

It is doubtless to the Punic architecture of Africa and of Sicily, that the Romans owed their preferred system of construction by concrete of bits of stone and lime mortar. (Page 170).

Finally, from the fact that the practice of vaulted construc-

construction in bricks was later than the contact of Rome with the East in Mesopotamia, one may infer that it borrowed from thence this principle.

Yet it is important to carefully specify, that the Romans d dominated their borrowings, and that if they employed foreigners, they subjected them not only to their methods, but also to their own conceptions and tastes. For there was a Roman f fashion, whose reality and characteristics will be manifested in the course of our study.

Indeed it is only just to point out, that the Roman West produced architects of merit; witness Cossutius, who about 175 A. D. was charged by Antiochus Epiphanes with the construction of the Olympeion of Athens; Valerius of Ostia, the author of the Pantheon of Agrippa; Severus and Seler, who labored for Nero; Rabirius, who rebuilt on the account of Domitian the Temple of Capitoline Jupiter; Julius Lacer, who under Trajan built the Bridge of Alcantara, etc.

With the immensity of the Roman empire, the physical diversity of its territories, the variety of its peoples, the antiquity and the vitality of some of these, it was fated to have more than one architectural school. Actually under examination made from our point of view, it reveals a great separation into two areas, one western and the other eastern, on this side and beyond the meridian of the Adriatic, and a subdivision of each into several provinces.

The western region, the only one properly Roman, was the domain of construction in bricks or by a concrete of stones and mortar, with a decoration by a facing. In this is recognized a metropolitan school, to which belonged more particularly Rome and the Roman Campagna, in a lesser degree central and northern Italy; a school of southern Italy and Sicily, strongly permeated by Hellenism; an African school, active from Tunisia to Morocco, which associated with Greco-Roman elements some of Punic origin; finally a Gallo-Roman school characterized by e exemplary construction and by charming qualities of elegance and grace.

The oriental section was only connected to the western by a small number of very loose bands; it was distinguished from t the latter by the constant practice of construction in cut stone, sometimes joined by mortar, and by a realization of the

[illegible] Tigris and Abu Hiter [illegible] in the [illegible], largely affected by the Roman conception of civil [illegible] [illegible] of [illegible].

[illegible] criminal elements,

[illegible], unconsolidated, [illegible] exclusively of [illegible] [illegible], [illegible] of [illegible] [illegible] [illegible] [illegible] in the [illegible] [illegible]

[illegible] Rules, in the [illegible] of the [illegible]

[illegible]

Note 1. See Volume II, [illegible], Part 2, Section 1, and text [illegible].

During the middle of the 3rd century A.D. [illegible] of the 3rd century A.D., Roman architecture [illegible] in [illegible], in large measure a [illegible], and [illegible] [illegible].

[illegible] [illegible] of [illegible] and [illegible]. [illegible] [illegible] [illegible] [illegible] [illegible] and [illegible].

[illegible] and [illegible] [illegible], [illegible] [illegible] of [illegible]

[illegible]

ornamentation by sculpture of the structural materials.

Greece and Asia Minor remained in the Hellenic path, scarcely affected by the Roman conception of civil programmes and by the Roman system of vaulted construction.

Syria formed a separate artistic region, where were introduced on the native ground Hellenistic and oriental elements. It was further divided into several cantons; central Syria or the Hauran, characterized by a construction exclusively of stone and singularly expert, which made of basalt or of limestone -- according to whether it operated in the south or the north of the country -- even the beams, doors and closets, and which understood covering by a dome; Judea, in the time of the Idumean princes and of the Roman administration, when a composite style combined Phoenician forms with Hellenic and Arabic motives; finally, Arabia Petra, that practised a picturesque and capricious architectural style, a hybrid like the preceding. [1]

Note 1. See Volume II, Book I, Part 3, Section 1, and Part 4, Section 1.

From about the middle of the 3 rd century B.C to about the middle of the 3 rd century A.D., Roman architecture was carried on by an evolution, in large measure a sequence to that of Roman society, and it passed through four phases.

During the first, which terminated about the middle of the 1 st century B.C., prevailed an Etrusco-Hellenic style, but w with a truly Roman expression, frank, quiet, with incontestable qualities of character and dignity. The monumental construction was exclusively of stone, almost always in tufa or coarse limestone, masked by a coating of stucco and perfectly dressed. The decoration was moderate, the relief firm and pure. The Sarcophagus of Scipio Barbatus, the Temples of Pieta, of "Fortuna virilis", of Fortune at Preneste, the Tabularium of Rome, and Temple of Vesta at Tivoli, mark this first stage.

In the decline of the republic, the Grecian element under its Hellenistic and Alexandrine forms gained favor, at the uame time that appeared a tendency to force the effect by a development of the relief and the ornamentation; the change is a apparent in an edifice such as the Temple of Hercules at Cori. Under the principate of Augustus, it was accelerated in conse-

consequence of the ability to multiply and refine the sculpture, permitted by the substitution of a construction in marble for that in common stone. Excellent stonecutting, superb entreties and magnificent details recommend this second epoch, r represented by the Portico of Octavia, Theatre of Marcellus, portico of the Pantheon, Temple of Augustus (Maison Carree) at Nimes. The Temple of Castor and Pollux (Temple of "Jupiter Stator"),of Mars Ultor, Forum of Nerva, that of Trajan and the Coliseum.

A third age was contemporary with the epoch of the Antonines and in general with the 2 nd century A.D., and was distinguished by the triumph of construction in burned bricks and in a c combination of concrete, mortar and cut stone, with a profusion of adventitious decoration in costly materials, which betrays oriental influences. The Temples of Rome and Venus, of Antonine and Faustina are evidences of it.

With the 3 rd century commenced a last period. It is marked by the contrast of a serious degeneration of sentiment for effect with a remarkable persistence of the most brilliant constructive faculty; while by simple and economical means were r realized masterpieces of appropriateness and marvels of vastness, richness of materials was preferred to beauty of forms, and a foolish multiplication of oranments produced a confusion in appearance, more strongly characterized because the motives lost their relief and the work became effeminate. The passion for the colossal is equally characteristic of the art of the time, whose memory is preserved by the Arch of Septimus Severus, Baths of Caracalla, those of Diocletian and his Palace of Spalato, Temples of Palmyra and of Baalbec, Basilica of Maxentius and Constantine, that of Treves, and the Arch of Constantine.

Chapter 3. Programmes and their Realizations.

With regard to realization as to invention, the Roman progr-
ammes of the civil order are admirable. Expressing the ambit-
ous energy and the organizing genius, which made the fortune
of the ruling people, they possess qualities to be required f
from an architectural work; appropriateness for the purpose,
practicla simplicity of the economy, clearness of arrangement,
and majestic grandeur of scale, when they belong to the monum-
ental category.

I. Public Works. -- Civic Buildings. -- Fortifications.

Nothing better distinguishes and remommends Roman architect-
ure than its skill in public works; in the matter of roads for
communications and the supply of water, it not only eclipsed
all preceding schools, but again has had no rival during near-
ly two thousand years. It is true that it had been at a good
school as a disciple of Etruscan art.

For the primitive conception of the trail, which its predec-
essors had never passed beyond, it supstituted that of the eq-
uivalent of a street for test by man and storms; this was a c
constructed road between two wide terraced ways, a veritable
band of solid masonry, whose paving with broken stone or slabs
was kept dry by the convexity of its profile. It favored the
rapid travel of state couriers, while because of their relati-
ve elasticity, the borders were suited to the traveling of men
on foot or horseback.

Roman bridges do not oppose excessive slopes to passage, and
by the spans of their arches, [1] they present no obstacle to n
navigation and need not fear freshets, so much the more that
the thinning of their piers upsteeam facilitates the flow of
the river.

Note 1. These measure 65.6 ft. at the Bridge of Treves, 88.5
ft. at that of Alcantora, 116.0 at the Bridge of S. Martin, b
between Aosta and Ivree.

What remains of the Port of Ostia attests that the Romans k
knew how to compose a complex and thoughtful entirety of jett-
ies, basins and warehouses.

Yet the triumph of the Roman civil engineering was the water
supply of the cities. Nothing was better understood, more pr-
actical and more certain than its system, whose quality is me-

lot and a structure (castellum) with three reservoirs for t[illegible] supply: one for public fountains, another for the baths, and the third for private citizens. Between these two ends [illegible] a normal [illegible] the profile of the ground; here a tre-[illegible] of [illegible] following the profile of a valley, and an inverted [illegible] with [illegible] intended to prevent excess of pressure and to favor the speed [illegible] for injuri-es; elsewhere a [illegible] supported by a bridge, [illegible] examples of which are [illegible] by the Pont du Gard ([illegible]),

[illegible] for the [illegible] of the [illegible] and the [illegible] of the channels, but as [illegible] points were [illegible], [illegible] of [illegible] — such as the [illegible] of [illegible], which [illegible] more than 13,[illegible], or again the [illegible] of [illegible] for the [illegible] of [illegible], more than [illegible] cu. ft.

An equally just comprehension of the needs, and an understanding of the means of satisfying them characterized the munici-pal programmes [illegible] by Roman architecture. Streets [illegible] paved and generally supplied with sewers, provided with si-[illegible] and crossing stones with access for the passage of [illegible] and wheels of carriages; open squares provided by [illegible] and [illegible] fountains; rapid removal of rain water and sewage through [illegible] abundantly furnished with water, [illegible] of their [illegible] and removal of water, [illegible] conditions [illegible] of [illegible] century has not yet [illegible] in [illegible] (1[illegible]).

[illegible] of the [illegible], and the military [illegible] the Romans [illegible] in [illegible] themselves to [illegible] the art of [illegible]. [illegible] by the walls of [illegible], the [illegible] of Arles, the [illegible] walls of Rome [illegible] by [illegible]

measured by certain realiqations still utilized today! At the soucce, frequently distant, was a collecting basin; at the outlet was a structure (dividiculum) with three reservoirs for t the supply; one for public fountains, another for the baths, and the third for private citizens. Between these two ends w was a channel suited to the profile of the ground; here a trench flush with the ground and covered by slaps; there ducts of lead or of terra cotta, underground or following the profile of a valley, and in reversed portions with siphons intended to prevent excess of pressure and to favor the search for injuries; elsewhere a channle supported by a bridge, typical and grand examples of which are presented by the Pont du Gard (322), by the aqueducts of the Roman campagna, those of Segovia, etc. at certain distances were means for the aeration of the fluid and the cleaning of the channels, and at selected points were filtering basins, vaulted cisterns, sometimes of colossal proportions -- such as the Piscina Mirabilis of Baia, which covers more than 19.376 sq. ft., or again the caverns of Bordj Djedid, which for the service of Carthage stored more than 1.060,000 cu. ft.

An equally just comprehension of the needs, and an understanding of the means of satisfying them characterized the municipal programmes established by Roman architecture. Streets well paved and carefully supplied with sewers, provided with sidewalks and crossing stones with spaces for the passage of horses and wheels of carriages; open squares bordered by porticos; numerous fountains; rapid removal of rain water and sewage; covered markets abundantly furnished with water; numerous and commodious baths; even public latrines with careful drainage of their pavements and removal by water, realized conditions of hygiene, of comfort and of propriety, that the humanity of the 20 th century has not yet succeeded in entirely restoring. (297).

The "Roman peace", which dispensed with fortifying the cities in the interior of the empire, and the military inferiority of the barbarians without siege machines, were the causes that the Romans did not devote themselves to perfecting the art of fortification. Such revealed by the walls of Pompeii, the ruins of Aosta, the enclosing walls of Rome supplied by Aurelian

(...), ... Tironnis, the (late Norman ...) of Cyprus, — the type of round defense compelled prevented curtain w... flanked by square towers, and placed between two very ...

[illegible]

gateways with internal vestibule open to the sky, between ... [illegible] ... rising doors. " (208,1.11).

[illegible]

... square opening ... 21.6 ...; the depth of the vesti-... to ... ft.

II. ... Programme.

The ... programme of the ... which was required by ... the efforts to ... the work of building. ... as a ... was ... from the ground ...

[illegible]

... and divided into the ... of ... [illegible]

[illegible]

... which was ... a ... , ... the ..., it ... -... extension: ... first, ... of the ... and ... more ... of its ... I ... against the original principle of the ... of an arrangement with reference to a ...

[illegible]

... of ..., and it did not so ... departs ... the ... from those of ...

The plan of the ... is ... the outline of a parallelogram ... ... (...,11). ... the centre was ... place for a ... -... wall, ... of ... to ... the ... of the ... a ... arranged ... A ... of this area was then open to the ... ... of the ...). A ... (...) ... which received ... main ... by ... and ..., its surface into a ...

(299,3), the camp of Troesmis, the Gate Porta Nigra of Treves, -- the system of Roman defense compsised crenelated curtain w walls flanked by square towers, and placed between two very p prominent towers, with polygonal or semicircular plans, were gateways with internal vestibule open to the sky, between an external opening closed by a portcullis and an internal one with folding doors.[1] (299,1.2).

Note 1. At the Gate Porta Pretoria of Aosta, the width of the middle opening measures 27.0 ft.; the depth of the vestibule is 39.5 ft.

II. Domestic Programmes.

The Roman programme of the tenement house was required by t the effort to reduce to the minimum the cost of building. At Rome a slight structure was carried as high from the ground as permitted by the law, even to 70 ft., in danger of falling as much as of fire, and divided into the greatest number of miserable hovels possible, smoked because of the lack of chimnies.

For the house of the citizen, Roman architecture successively conceived three types; at first the model was taken from E Etruria; then toward the end of the republic, it imported Grecian elements;[2] finally in the course of the imperial epoch, it became more and more common in the sense of its Hellenistic rival. It always applied the oriental principle of the closed facades and of an arrangement with reference to a small internal court. On the other hand, Roman customs did not require the seclusion of women, and it did not so rigorously separate the domain of public life from that of an intimate existence.

The plan of the Etruscan-Roman house was inscribed within t the outline of a parallelogram or of an approximate figure. (301,1). At the centre was reserved the place for a great rectangular hall, whose significant name of atrium (the black) c came to it from its blackening by the smoke seeking its way to a large opening arranged in the middle of the roof and termed compluvium. A good part of this area was then open to the sky; it was named cavedium (cavern of the house). A basin (impluvium) was also excavated there, which received the rain water shed by the roof and discharged its surplus into a lower cistern (puteus). As for the sheltered area of the atrium, it formed a corridor serving the entire dwelling. The entrance fr-

from the street formed a succession of a vestibule, sometimes projecting but generally recessed, a doorway and a passage (f (fauces) on which opened the lodging of the doorkeeper.

In the middle, on the side opposite the atrium and for its entire width a square area was occupied by a hall termed tablinum, whose front was entirely open and without means of closing except the screen of a curtain. This was the usual room of the master, both his working room, his archives, his hall for the reception of clients, who visited him each morning. His position overlooked the entire dwelling, its size and its wide opening made it perfectly appropriate for these various purposes. At the right and left, it was flanked by a chamber, before which the extension of the rear corridor of the atrium formed small rooms (alas) devoted to the exhibition of the images of the ancestors.

From "wings" to the street was arranged a series of rooms f for use as sleeping rooms, kitchens and servants. An elevation with a second story was frequent, in view of lodgings for slaves and sometimer for rental.

In brief, a clear and practical arrangement, expressive of its purpose and of marked character, which submitted the entire habitation to the patronage of the ancestors as to the eye of the master, and to favor the manifestation and exercise of the social side.

The permeation of Roman civilization by Hellenism complicated the programme of the mansion of the rich by the distinction between a selamlik and a harem (301.2). For the first the Etruscan-Roman arrangement was perfectly suited; it was retained and the second was realized by forming behind a symmetrical w whole termed peristyle (300). This had ar an essential element a court with basin or terrace enclosed by porticos, under which opened closed rooms (oeci) or open ones (exedras), dining rooms for summer and winter, art galleries, libraries and chapels. The peristyle was sometimes doubled, and the luxury of a small garden was added. Communication between the harem and the serail was assured by a passage adjoining the tablinum, and at need by the omission of the movable partition serving as the back of the latter.

This formula was further susceptible of variations suited to

the conditions of the site and the taste of the owner. At first modest, the scale of its examples rapidly increased under the empire, corresponding to the advance of Roman luxury.

The practical economy of the habitation was well understood; awnings shaded the courts; basins, tanks and jets cooled the air at the same time as they pleased the eyes. Drainage and removal of rain water and sewage were ensured by drains connected with the municipal sewers; flues carried off the smoke from the kitchens. Every careful programme comprised a comfortable installation of baths and frequently central heating by a furnace, with circulation of heated air beneath the floors and behind the surfaces of the walls.

At Rome, the imperial palace was merely a development in luxury and dimensions of the private mansion. If as an example be taken that of the Flavians on the Palatine, known under the name of the House of the Flavians, there are distinguished at the first view the amplified equivalents of the atrium and of the peristyle (3013).

First is a building with facade preceded by a portico; around a central court, enclosed by porticos, follow various rooms; in the middle of the front side is a vast throne hall (aula regia) flanked by a small basilica with a tribune for the exercize of the judicial power of the prince, and a private chapel (lararium); at the rear a symmetrical arrangement has placed a festal hall between winter and summer (nympheum) halls, cooled by a basin .

The harem is distributed around a peristylar court and is d decorated by a great garden within a rectangular enclosure , being terminated at each end by a semicircle and curved into an exedra at the middle of one of the longer sides.

On the whole a logically organized entirety with grand effect.

The ruins of the Palace of Diocletian at Spalato reveal the programme of an imperial palace in the decline of the empire . (301,5). Conditioned both by the oriental tendencies of Roman civilization of that time and by the insecurity of a region n near the threatened frontiers, its programme was that of a fortified capital. The general arrangement repeated that of a R Roman camp, a rectangular area was enclosed by a wall flanked by towers, and divided in four parts by the intersection by

two middle streets. The northern half formed the administrative quarter (barracks, offices and storehouses, arranged around two great courts with porticos. The southern half was div-
457 ided in two parts; on the north two royal courts on both sides of the avenue contained, one the chapel and the other the tomb of the master; to the south extended the palace. A grand circular vestibule gave access to the latter, that comprised at the centre reception halls with apartments in the wings and a long gallery facing the sea. Again an arrangement stamped with order and grandeur.

The Romans conceived three types of country habitations. W Without mentioning those termed rustic and pseudo-urban -- the one being the dwelling of the master of a rural cultivation, the other a simple country house skilfully adapted to comfort and pleasure -- the so-called urban villa responded to our idea of a princely chateau. It was frequently a magnificent entirety of luxurious structures, pavilions, porticos, baths, g gymnasiums, shaded alleys and lawns, with living waters, grottos and sometimes -- the Villa of Hadrian at Tivoli offers a typical specimen -- with reductions of celebrated buildings or sites.

458 Let us note that the Romans were extremely attentiwe to orientating their apartments so as to enjoy pleasing views, and according to the seasons and the hours, to lose nothing of the solar radiation, or to protect themselves from it.

III. Programmes of Public Utility.

One of the principal titles of Roman architecture, and one of the most decisive proofs of an admirable sense of organization is the singular quality of the programmes of its edifices of general utility, markets, exchanges and pretoriums, theatres, circuses, amphitheatres and baths.

The place of assembly are for economical, political or judicial purposes, or simply for pleasure, was either an area open to the sky, generally surrounded by porticos, sometimes doubled (forum)(303; 295), a covered hall (portico), or an enclosed hall (basilica).

The market (macellum) as shown by the ruins of Pompeii, Pozzuoli or Timgad, was composed of a court, generally rectangular, bordered by porticos on which opened the stalls; the cent-

centre of the deifice was sometimes occupied by a sanctuary -- it was thus at Pozzuoli -- more frequently by a basin with a fountain. Construction entirely in stone, sometimes of costly kinds, favored cleanliness and sanitation.

The Roman basilica was a very satisfactory solution of the problem of a covered public place. It was sometimes reduced to a single aisle, whose dimensions might indeed be considerable; witness that of Treves, which measured 90 ft. wide with a length of 181 ft. and a height of 102 ft. More frequently rows of columns separated several aisles, the middle one being wider and higher than the side aisles; its greater height made possible its lighting by windows placed in its enclosing walls above the lower aisles. These were sometimes four in number, as the case for the Roman basilicas named Julia, Paulla and Ulpia; more frequently were but two, which were sometimes divided at mid-height by a gallery. The system of multiple naves greatly increased the areas, and since the Roman mode of connecting isolated supports by arches permitted ample intercolumniations, this opposed no obstacle to the necessary spaciousness of the place; the Basilica Julia covered 54,000 sq. ft., the Ulpian more than 43,000, that of Maxentius 48,500, and the middle aisles of the two last mentioned measured more than 82 ft. in width! (304; 303,B;326). Sometimes a return at right angles, of the side aisles across the ends of the plan and perpendicular to the main axis, formed an ambulatory, termed chalcidicum (304,1,2).

At first rectangular, the rear of the Roman basilica, to which was attached a tribunal, was later curved in semicircular form (304,3). The facade was sometimes preceded by a portico. Generally the facades were closed in the ground story; yet the example of the Basilica Julia at Rome attests, that it was admitted that they were sometimer opened by arcades (304,2).

Thus Roman architecture was the first to conceive and to realize a programme both practical and grand, for a place suited for the assemblage of a multitude.

It no less understood how to arrange a hall for a spectacle. Doubtless it profited by the experience of its Grecian predecessor for the theatre and the circus. But it realized too many perfections in importance to be reduced to the condition of

a sacrifice, and as [illegible], [illegible] own [illegible] the [illegible] of the [illegible] of [illegible] sanctity, the [illegible]

[illegible] (symbolic) [illegible] expressed as [illegible], see [illegible] [illegible] effects [illegible] [illegible], and [illegible] of [illegible] [illegible]. [illegible] sense of [illegible] and are [illegible] a [illegible].

[illegible] differences, resulting from a different [illegible] of the [illegible], or [illegible] sense of the [illegible] conditions a [illegible]. [illegible]

[illegible] of a [illegible] the hall for [illegible] of [illegible].[1] Another complication — [illegible] [illegible] in [illegible], is explained at [illegible] in the [illegible] on the [illegible] [illegible] of [illegible] of masonry.[1] In the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of the [illegible] [illegible].

Note . The [illegible] of the [illegible] of [illegible] [illegible] 2

[illegible]

[illegible] the [illegible] of [illegible] [illegible] in [illegible] [illegible] of a [illegible] [illegible] [illegible]

[illegible], whose division will [illegible] in [illegible] [illegible] [illegible] [illegible] courses. It was [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible]

a satellite, and as for the amphitheatre, to its own genius is due the honor of the masterpiece of practical simplicity, that constitutes many of its arrangements.

In general the Roman theatre reproduced that of the Greeks. A stepped semicircle (theatrum) generally terminated at top in a high gallery, and was divided into sectors (cunei) by radiating stairways, and into stories by one or more concentric walks (praecinctiones). It enclosed the area of an orchestra a and was opposite a platform (pulpitum).

Yet the Roman formula was distinguished from the Hellenic by notable differences, resulting from a different conception of the play, or from a better sense of the material conditions a and the convenience of the public. Passing to the stage, this was enlarged at the expense of the orchestra, which was reduced to the area of a semicircle annexed to the hall for the location of places of honor. [1] Another modification -- more important from the standpoint of acoustics, it realized an enormous advance -- consisted in the erection at the rear and sides of the stage, of a high screen of masonry, [1] in the connection of its ends with the wall supporting the semicircle; finally in the installation of a sound reflector over the platform, a and even in the ~~entire covering~~ of the edifice. [2](305;176;177).

Note 1. The stage of the Theatre of Orange measures 201 ft. long and 30.5 ft. wide; that of the Theatre of Pompey at Rome being respectively 328 and 52 ft.

Note 1. At the Theatre of Orange, its height is 118. ft.

Note 2. As an example of a covered theatre may be cited that of Aosta.

The Roman circus (arena) was an area about five times longer than wide, whose division wall extended on its greater axis a and formed a continuous course. It was limited at one end by a semicircle, and at the other or entrance end by an arc of a circle. Along this at the centre was found a triumphal gateway, and at both sides were stalls (carceres), in which the competing chariots awaited the signal for departure; above were arranged boxes for the magistrates and an imperial box at Rome. Along the remainder of its perimeter, the course was overlooked by a series of easily accessible steps, thanks to an ingenious and simple disposition of stairs, of external passages a

and internal galleries. Roman circuses were of colossal proportions. The "Great Circus"(Circus maximus) of Rome measured 2083 ft. in length by 360 ft. and contained 150,000 spectators! The insertion of the middle wall exhibited that faculty of foresight and of practical sense, that recommends Roman architecture. Since it was necessary to facilitate the access of the competitors to the course, and one might rely upon a progressive reduction of the front of their group by the distancing of the inferiors, they conceived the idea of moving the wall to the left at the point of departure, inclining it to the axis of the arena, so that the going course was wider than the returning one, but each being more so at their beginning than end.

The faculty of foreseeing and of providing, of assigning to every function the proper organ, is even better appreciated w when the construction of the Roman amphitheatre is examined in its most complete example, the Coliseum at Rome (290; 307; 302). All is admirable there; the amplitude, the perfect unity, the clearness of the conception of an entirety whose length measures 614 ft., its width 510 ft. and height 159 ft.; the care a and the sense of adaptation of the elements to their role, which is indicated by the choice of an elliptical outline -- in spite of the differences introduced in the execution-- because of the facilities offered by an axial arena for arranging the spectacle; the practical installation of the storerooms, of t the "side scenes", of the necessary machinery in the cellar, excavated in galleries, in cages for keeping the wild beasts, in sewers for rapidly emptying the area, when it had been transformed into a basin for nautical games; the perfect drainage of the edifice; the accurate accommodation of the projections of the stepped seats to the requirements of the visibility of the spectacle; the arrangement in the lower structure of the amphitheatre of galleries for shelter in case of storms; the ingenious arrangement of a movable awning, managed from an external gallery at the top of the edifice, permitted the shading of portions in the same, as well as the refinement of a circulation of water to cool the air, even the distribution of p perfumed air! Particularly should be praised the simple and clear arrangements of the escapes, by which in a few moments

with a very orderly service, a crowd of 50,000 persons could be passed out or in ("vomited", to use the picturesque and significant expression of the Romans). [1]

Note 1. The opening of 76 numbered arches in the ground story permitted the division of the multitude of people into as many columns. Each one of these with the barriers opened was fed by the passage of a series of stairways more or less wide from the various concentric passages, which by radial steps e extended to the stepped seats of a sector of the plan.

The programme of the Baths is no less a masterpiece of organization.

Complete, a Roman bath successively comprised:-- sweating, or a stay in hot water, reaction in cold water, and anointing the skin; further, it was preceded by gymnastic exercises, sportive games, conversations and literary hearings. This tells the complexity of the arrangement of a bathing establishment, appropriate for so many and such diverse purposes; and how thoughtful and wise such installations must be. On the one hand, the bath service required a dressing room.(apodytium), a warm room (caldarium), a hot room (laconicum), a cooling room (frigidarium), a hall for anointing (unctorium), a warmed room (t (tepidarium), forming a transition between the rooms with extreme temperatures and between the whole and the exterior; finally, a powerful heating furnace (hypocaust), with a practical system for the supply and removal of water. On the other hand, for the exercise and pleasure of the visitors were required o open walks, covered porticos, gymnasiums, exedras, halls, rooms for lectures, and libraries.

Now if there be taken the Baths of Caracalla as the type of this realization, this confirms the mastery with which Roman architecture acquitted itself of the task proposed to it (309). In conformity to its intermediate role, the tepidarium occupied the centre of the structure; equally near the vestibules, accompanied by the vestiaries, the cold hall (308) and the warm hall flanked by the hot rooms. The cells with reserved baths extended before the public baths along a portico, each being provided with an anteroom. The economy in heating was quite remarkable, reduced in expense and perfectly sanitary. The furnaces were placed under the rooms, whose temperature w

as [illegible] erected, which were covered [illegible] with lions of stone by an [illegible] of a trophy; the [illegible] from the furnace of the bellows brought into the air only after having circula-ted through [illegible] the catacombs of the base, [illegible] the [illegible] of [illegible] was above the labyrinths of their vaults.

The [illegible] of the sacred edifice was [illegible] the [illegible] of the [illegible], under the [illegible], [illegible] and [illegible], but [illegible] great [illegible].

In [illegible] the [illegible] and [illegible] to [illegible] the [illegible] of the [illegible] ([illegible]), the [illegible] and a treasury of [illegible]. Thus it was designed on a small scale, substantially composed of a chamber (cella) and an altar before the entrance ([illegible], 11).

The plan generally represented a rectangle, whose major axis passed through the doorway; but if the site so demanded [illegible] of execution in doubt, Roman architecture did not hesi-tate to adopt a [illegible] plan [illegible] the [illegible] of [illegible] at Rome (III,IV,[illegible]). Likewise for the orient-[illegible] the [illegible] should look toward the sunset; in fact, [illegible] was conditioned by the location.

[illegible] The [illegible] sites mentioned [illegible] the larger sites because the location of the first was [illegible]

Religious [illegible] did not necessarily involve an attachment [illegible] to the [illegible] its [illegible]; [illegible] (III,1,[illegible],3), like those of [illegible]

[illegible] by the [illegible] of [illegible] of Council and that [illegible]

[illegible] by means of a series of [illegible] of the [illegible] walls of the cell. But a [illegible] of [illegible] -- the form [illegible] of [illegible]

was to be elevated, which were ensured against their loss of heat by an antechamber or a lobby; the gases from the furnace of the boilers escaped into the air only after having circulated beneath the pavements of the halls, behind the surfaces of their walls and above the intrados of their vaults.

IV. Religious Programmes.

The Roman conception of the sacred edifice was nothing more
466 than that of the Etruscans, under the empire scarcely competed with by the Greeks, but without great success.

In imitation of its models, the Roman temple had no other p purpose than to shelter the statue of the deity reputed to inhabit it, the ritual equepment and a treasury of precious offerings. Thus it was designed at a small scale, substantially composed of a chamber (cella) and an altar before the entrance. (310, 11).

The plan generally represented a rectangle, whose major axis passed through the doorway; but if the site at command did not permit an extension in depth, Roman architecture did not hesitate to adopt a contrary form [1] like the Temple of Brescia and that of Concord at Rome (310,10,15). Likewise for the orientation; canonically it should extend from east to west, so that the sacred image should look toward the sunset; in fact, this was conditioned on the location.

Note 1. The edifices mentioned have their facades on one of the longer sides because the location of the first was opposed by a hill, and that of the second by the existence of the Tabularium.

A programme for a Roman temple did not necessarily comprise an antechamber equivalent to the Hellenic pronaos; carefully
467 built sanctuaries had none (310,1,5,6,8), like those of Fortuna Virilis or of Castor and Pollux at Rome, those of Nimes, of Vienne, of Cori etc. Further there are examples -- such as t those presented by the Temple of Jupiter at Pompeii and that of Esculapius at Spalato (310,2,12) -- of a very elementary r realization of that element, by means of a scarcely marked projection of the longitudinal walls of the cell. But a number of important edifices -- the Roman temples of Concord, Vespasian, Antonine and Faustina, Rome and Venus, etc. -- amply develop that preliminary portion. (310,10,3).

In general, the cell is lighted only through the doorway; y yet the Temple of Tivoli (312,4), those of Palmyra, and the Roman Pantheon (286) attest that a portion of the light was a admitted by windows; the programme of the Pantheon only provided one, in the form of a large opening at the top of the dome, which dominated from above an interior too vast for the entrance of rain to form an inconvenience. Sometimes and notably in the eastern part of the empire, a semicircular opening was pierced over the doorway.

Like its Etruscan model, the Roman cell was always preceded
408 by a columnar portico, characterized by very great depth and by restricting the supports to its exterior (310,5-7;280). It was rare -- which is still an indication of Tuscan affiliations -- that it is flanked by porticos along its sides and rear. (310,11). The Temple of Vienne attests the borrowing from Etruscan art of the arrangement with lateral colonnades abutting against two wings extending from the body of the cell at its rear end (310,8,14). As specimens of the Grecian arrangement with a continuous peristyle may be cited the Roman Temples of Castor and Pollux, of Rome and Venus, and those of Baalbec. (310,9,13).

The Roman temple was always elevated on a substructure termed a podium. It was exceptional for this to be in the Grecian mode, connected with the ground by a border of steps; according to Etruscan taste, it was enclosed by vertical surfaces, s sometimes pierced by openings, when containing rooms within i its mass, as observed in the previously cited Temple of Castor and Pollux. The platform was accessible in front by a flight of steps more or less prominent, with a stairway between side walls, whose width varied from that of the central intercolumniation to that of the entire edifice (310,10,11; 289). It occurred that this was utilized as a tribune -- witness the Temple of Castor and Pollux, that of Jupiter at Pompeii, and the Chapel near the Curia at Timgad (310,12,13).

Most temples were peculiar to a single deity, yet triple sanctuaries were not wanting; they were further required for the worship of the triad of Jupiter, Juno and Minerva, inherited from Etruria. Complication sometimes resulted, as at the Temple of Jupiter at Pompeii, from the arrangement of the rear of

the cell in three chapels (310,14); sometimes, as at Brescia (310,15), from a fundamental division into three distinct aisles, externally announced by the triple doorways, and even by a broken arrangement of the flight of steps with a prominent middle portion; finally, sometimes, as at Subetula (Sbeitla), by the alignment on the same front of three distinct edifices
469 with short intervals, the middle one dominating the others. (310,15). Note again the coupling of two sanctuaries adjoining within the interior of a common peristyle (310,17).

Roman religious architecture loved circular plans, especially when required to lodge Vesta or Hercules. Sometimes this was a columnar pavilion, sometimes a rotunda without peristyle, -- the Pantheon presents a colossal specimen, -- more frequently surrounded by a portico -- witness the Temples of Vesta at Rome and at Tivoli, the Serapeum of Pozzuoli, and the small r round Temple of Baalbec (312).

Sometimes, but the case was more rare, the plan of the Roman temple comprised an enclosure by porticos in the Grecian fashion -- the Temple of Apollo at Pompeii offers an example -- a and even a sumptuous arrangement of the preliminary elements; terraces in stories as at Palestrina, propyleums and external vestibules as at Baalbec.

V. Funerary Programmes.

To the programme of the tenement house corresponded that of the columbarium in the domain of funerary architecture, otherwise termed that of a common tomb, in the form of a great rectangular vaulted hall, in the walls of which were recessed hundreds of niches suited for placing one or more cinerary urns.

For the individual tomb, several types competed.

Sometimes the sepulchre was subterranean, marked by a stele, column, cippus, or by a small structure with the appearance of an altar or a chapel. Rare before the 2 nd century of our era, burial in a sarcophagus finally became more and more common. (329). The imperial epoch preferred the arrangement of a sepulchral chamber in the mass of a monument; the form of the latter was frequently that of a drum placed on a plinth and surmounted by a mound planted with trees, or a depressed frustum of a cone, at whose summit rose a statue of the deceased; such were in colossal proportions the Mausoleums of Augustus and of

Hadrian at Rome (330,3), and again that of Caecilia Metella on the Appian Way; or indeed this was a small structure with complex elevation to be studied at a greater distance. [1] In the 2 nd century A. D. commenced the fashion of a tomb in the form of a temple, as examples of which may be cited that of the Flavians on the Quirinal, the Temple of "Deus Rediculus", the great Tomb of Torre dei Schiavi near Rome, the Mausoleum of Diocletian at Spalato, and the Roman Church of S. Costanza, the transferred Tomb of Constantia, daughter of Constantine. The plans were rather polygonal or circular than square; a chapel intended for the funerary rites surmounted a sepulchral crypt. It is proper to mention separately the rock-cut tombs of Arabia Petra, composed of a bare cavern excavated in the rock and a great front carved in the image of a facade. (335). Finally let us note, that where cremation was the rule, the necessary complement of a family tomb was an ustrinum, i.e., an enclosure intended for the cremation of corpses.

Note 1. Monument of Igel near Treves, that of Julius at S. Remy, that of Dougga, and that of Absalom in the valley of Jehoshaphat. (Pages 496-497; Figs. 330; 313).

VI. Commemmorative Monuments.

The monument commemorating national military events, the imperial glory, the loyalty of a city, consisted of either a trophy, a column, or particularly of a triumphal arch.

The first of these types, illustrated by one of Augustus near Nice, and especially by one of Trajan near Adamklissi, had as the essential element a great cylindrical tower erected on a substructure and surmounted by the frustum of a cone, on the platform of which was placed the actual trophy.

The column, whose height might approach 130 ft., [1] rose on a prismatic base and terminated in a cap serving as the pedestal for a statue. In the interior of its shaft was a spiral stairway leading to the top, and it had for its surface a carved spiral band (292); it was covered by the beaks of vessels (rostra), when it relacced a naval victory (332).

Note 1. That of Trajan measures 125 ft. without the statue; that of Antonine is 97 ft.

Properly Roman, to the extent that its known applications a appear as symbols of the grandeur of Rome and of the Empire,

the formula of the arch comprises the erection of an oblong m massive structure, at first pierced by a single opening, [2] later by several, exceptionally two but usually three, with an inscription on the facade, and finally crowned by a group of statuary. Sometimes -- witness the Arch of Caracalla at Tebessa -- the ends were treated like the fronts. At first the a arch was actwally a widely opened gateway; then the solid portion always continued to increase, especially towards the top, so that at the beginning of the 3 rd century, the original structure found itself reduced to become the support of a statuary monument and for the exhibition of inscriptions, emblems and representations (331; 314).

Note 2. The width of its opening varies from 9.8 ft. to thrice that dimension.

After these three types of current examples, it is necessary to mention a fourth, the monumental altar, that Roman art borrowed from its Grecian rival. The Ara Pacis (Altar of Peace) consecrated by Augustus at Rome in the year 9 B.C., in commemoration of the reestablishment of peace, consisted of a platform of about 1292 sq. ft., bearing at the centre of a rectangular court enclosed by walls, an altar elevated by a stepped base.

Chapter 4. Construction.

The methods in construction pursued by the Romans are both very indicative of their temperament and exemplary in many respects. They exhibit a clear knowledge of the problems on a c conception always distinct, often grand and bold, of the means for solving them; a very assured acquaintance with the qualities of materials and the play of useful and injurious forces;
473 finally, taste for and the art of simple solutions, practical and economical.

I. The Materials.

Roman architecture required much wood for its current building, into which carpentry entered largely, and for its monumental structures, that sometimes comprised enormous roofs. At Rome, pine was preferred to resist flexure and oak to support a load. Sawing furnished timbers of the largest dimensions.

Clay was long the common material of the walls. In Spain a and Africa, it was directly employed, tamped into wooden moulds. At Rome, it was moulded into squares, that were dried before using.

From the 1 st century B.C., burned bricks were known to the
474 Romans. Not only at the beginning of our era, had they ousted their rival from every undertaking, however unimportant, but again from the 2 nd century and connected with the concrete of spalls and mortar, victoriously competed with stone for the execution of monumental programmes. Manufactured with much care, and according to their purposes, they were variously shaped s squares; rectangles, whose longitudinal section was trapezoidal, when they served as voussoirs; triangles; polygons used f for tile floors; circular sectors, with which were constructed columns, and in plates with projections for facings not adherent (318,6; 320,7,9; 322,1,3). Dimensions were no less variable; from 0.65 to 3.28 ft. for the sides of the squares, and from 0.8 to 3.9 ins. for their thickness. The current type, termed sesquipedal, measured 1 × 1 1/2 ft. (0.97 × 1.48 ft.); another in frequent use, termed bipedal, was square with sides of 2 ft. (1.96 ft.). ~~The current~~

The current stone materials at Rome were peperine, travertine, stone from Gabies and the "red stone". Luxurious structures freely employed the crystallized limestones of Luna.

The quarrying processes were those of the Greeks with equivalent results. For ordinary construction was quarried rubble; blocks of medium dimensions for cut stone work, their medium height being about 2 ft., and also colossal monoliths 19.8 ft. long (to be seen in the Amphitheatre of Nimes and that of Arles), even more than 23.0 ft., like those shown by the Amphitheatre of Treves. The cutting of the jointed facing was the object of the greatest care, even when the facade was to be masked by stucco; in the republican epoch and in the 1 st century A.D., it frequently equaled that of the Athenian stonecutters of the time of Pericles.[1] It also comprised the diminution of labor, that the contact surfaces were reduced to a border around a central hollow.

Note 1. For example, see the stonecutting of the Temple of Vesta at Tivoli and of the Amphitheatre at Nimes.

Roman architecture of the imperial epoch made a capricious use of marbles, furnished by the quarries of Greece, Asia and Africa. It loved the white sorts from Greece, the Porium of the region of Olympia, the Pentelicum and Hymettium of Attica, the Thasium of Thasos; the black marbles of Melos and of Laconia, respectively termed Luculleum and Taenarium; the yellow from Africa named Numidianum; the Serpentine from Thessaly; t
475 the veined marbles of Eubea, of Iasos and of Phrygia, designated by the names of Carystium, Iassense, Synnadicum, and oriental alabaster. Roman artisans excelled in sawing thin slabs and in polishing perfectly. They were no less skilful in preparing blocks of granite, basalt and porphyry, equally dear to the Romans, and which they brought from Egypt and Syria.

Yet from the 2 nd century A.D., the favorite material was a concrete of spalls, pebbles or porous and light blocks of lava with lime mortar. The use of this bonding material, whose presence in masonry gives it the name of cemented work (opus caementicum) is to be noted for the first time about 300 B.C. T The Romans prepared it by mixing with one part of lime three of sand, and further when the latter was not from a pit but f from a river or the sea, one-third of pounded tiles; they made a sort of waterproofing by mixing two parts of lime with five of sand. The excellence of "Roman cement" was derived from t the exceptional properties of a volcanic sand (pozzulane), fu

furnished by the Roman Campagna, and of which a superior sort was found in the vicinity of Pozzuoli (Puteoli), exported afar in enormous quantities.

Finally, Roman art employed on a grand scale as a coating g gypsum and stucco of marble dust.

Much metal was required; iron for the cramps lavishly used in masonry and for carpentry; lead for fixing cramps and for water pices; especially bronze, not only used for effect (page 510), but also for useful purposes, as for example the execution in this material for the foof of the portico of the Pantheon and of Basilica Ulpia.

We shall complete this enumeration by noting that Roman architecture of the imperial epoch had at command glass of a chemical composition entirely analagous to our own, and of which were made on the one hand, opaline plates (obsidianum), on the other two sorts of glass, one being translucent (translucidum) and the other crystalline (purum), both in dimensions attaining 3.28 ft. at the side.

II. The Procedures.

Roman construction was much superior to that of the Greeks. It is first revealed by its practice in carpentry. While i its rival had known only the elementary system of piling timbers on each other, it sketched out triangular arrangements and organic trusses not resisting the load directly but by extension and tension. This is revealed by the roof of the portico of the Pantheon with its raised tie-beams; the bridge thrown over the Danube by Trajan, an image of which is offered on Trajan's Column; the roof of the Constantinian Basilica of S. P Peter at Rome, known by accurate drawings. (317).

The great originality of Roman construction and what did it great honor, is its system of dividing the work by distinguishing between the structure, the parts for strength and the simple enclosures, otherwise termed the framework and the filling. That organic structure, equivalent to that of a body clothed with flesh, offers two advantages; a first one was that of facilitating a rational division of the requirements of execution into a higher task reserved for the best workmen, and into a secondary one referred to laborers of less capacities; a second was to permit a premeditated localizing of the stressed

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points and a concentration of the means of resistance; in brief, a guarantee of stability and an economy of material and of workmanship. The latter benefit Roman architecture again ensured by reducing to the minimum the amount of material and of effort; for example, preferring two walls spaced apart to a single great wall, a compound pier to a compact mass (page 479), to a continuous tunnel vault a series of arches spaced beneath a light shell (319,1; 324,7).

It succeeded the better, since as a general rule, it was conscientious and attentive to protect itself against risks. That is notably attested by its taste for strengthening by the penetration of the joint surfaces of two adjacent elements, a and still more by the fixing of tenons and metal cramps (320, 1,2,12; 321,5); a proof likewise is the care given to foundations, extending them down to solid ground, and in the lack of a firm natural stratum, by forming an artificial one by means of piles (318,4).

The Wall.

The construction in rubble and that in burned bricks -- certain specimens of the latter are of rare quality [2] -- joined its materials by a layer of lime mortar, varying in thickness from 0.2 to 1.6 ins., increasing in the course of the imperial epoch until it exceeded that of the bricks.

Note 2. See at Rome, the "Temple of the god Rediculus"; the Amphitheatre Castrense; the Basilica at Treves.

In a general way, Roman stone construction (opus quadratum)
418 can bear comparison with that executed by the Greeks, and its best examples -- for example, those shown by the Temple of Vesta, Forum of Augustus, and Amphitheatre of Nimes, are masterpieces of accuracy. At first prevailed the Etruscan mode of t the alternation of courses of stretchers and of headers; about the beginning of our era the suppression of the second arrangement introduced unity in arrangement. Except in the East and in Africa, where was sometimes practised joining with mortar, the materials were set dry, but strongly connected by dowells and cramps in the Grecian fashion, almost always of iron set in lead. In conformity to the principle of economy, the regulator of Roman practice, the materials varied according to the work imposed on them; thus at the Temple of Vesta in Rome, the

supporting nothing are in peperine, a material of medium resis-
tance, while those receiving the weight of the columns are in
travertine, which is stronger (318,5).

Construction in concrete rarely formed a wall by moulding i
its mixture of spalls and mortar in forms of wood, as for exa-
477 mple, for the substructure of the Roman Temple of Çastor and
Pollux, which has retained the impressions of the forms and of
their posts (318,7). The normal procedure consisted in const-
ructing two facings and in filling the intermediate space with
alternate layers of pebbles and of mortar (318,1,2). The fac-
ings were executed either in cut stone or in rubble, whose re-
ar ends tapered, or in square bricks, or rather triangular on-
es. The pointed form ensured penetration of the facings into
the nucleus, producing greater cohesion of the elements; this
was again increased by placing at regular intervals one or mo-
re courses of large bricks (318,1,2) extending through the en-
tire width of the wall; in Africa recourse was freely had to
ties by means of vertical and transverse stone beams, equival-
ent to the wooden framework of half timber construction (318,8).
At Rome, they loved to set the stone dies, whose faces measur-
ed an average of 3.15 ins. square, not on their sides byt dia-
gonally, so that their grouping presented the appearance of a
chessboard of lozenges, and the entirety of their joints, 0.2
to 0.6 in. thick, that of a network (318,1); hence the name of
reticulation (opus reticulatum) assigned to the arrangement,
and for which was substituted that of opus incertum, when the
dies were not regularly cut (318,3). The angles of an elevat-
ion of this kind were composed of masonry of stone or of brick.
(318,3).

If necessary to fortify a wall, the Roman constructor caref-
ully avoided all waste of material. He preferred a cellular
to a solid mass. Thus he enclosed a retaining wall by a seri-
es of semicircular niches convex toward the earth (319,2); and
again he built a strong wall -- such as that of the Pantheon--
with two concentric facings separated by a wide interval, con-
nected by cross walls and transverse arches (319,1). In a mo-
re general way, it may be said, that they always took pains to
economically stay a wall exposed to stress by flanking it by
another structure (319,4). Better still, it ingeniously conc-

concentrated the resistances against the loads at some points
systematically chosen. Instead of making the wall solid, it
was composed in one part of piers connected by arches and of
another of filling masonry. The arches received the pressures
and transferred them to their piers. Their strength was accu-
rately proportioned to their work, it being derived either fr-
480 om the support lent them by a buttress or projection prominent
externally, such as shown by the "Temple of Minerva Medica" at
Rome (319,3), or the wide bearing of a framework of arches.
Of this elegant and economical solution, the Pantheon presents
a typical and admirable example (319,1).

The penetration of dampness into the interior and the varia-
ble temperatures of places were obviated by the practical art-
ifice of a layer of air, for which the space was arranged, ei-
ther by the erection of double walls, or by the application to
the internal surface of a silid wall of a paneling of terra c
cotta tiles with projections, previously mentioned; behind th-
ese their projections produced a vacant space about 2.8 ins.
thick (318,6).

As for stairways, the Romans were expert in constructing th-
em of all sorts, visible and secret, with square or circular
turns, placed on a vault as well as on a solid mass, built of
stone or bricks.

Spanning an Opening.

To cover an opening, the Romans preferred to the monolithic
lintel the arch or the straight jointed arch, relieved or not.
They carried to perfection the construction of the arch, wh-
ose formula was due to their Etruscan masters. It was almost
always semicircular; rarely a segment of the circumference; e
exceptionally -- a practice of the schools of Cyrenaica and of
the East -- with the broken curve of an obtuse pointed arch.
The blocks were set dry, as carefully and successfully as the-
ir cutting. Precautions were taken against the risks of slip-
ping and of lateral displacement by making the blocks more st-
able by means of a system of metal cramps and of indenting by
tenons and mortises (320,1,2). Sometimes, with a view of fac-
ilitating the execution and of reducing the cutting to a mini-
mum, they adopted -- Palmyra presents a typical example -- a
compromise between the snstem of voussoirs and that of corbel-

corbelling; the plane of the bed was extended as much as possible and long bent voussoirs were employed, that were kept in place py the weight of their end set horizontally (320,3). An arch was also relieved by the construction of a straight arch above it (320,12).

The arch entirely of cut stone was in competition with a mixed type in which stone voussoirs alternated with those of bricks; with another entirely of the latter material; finally w with another entirely of the latter material; finally with a third, most Roman and original of all, the concrete of stones and mortar with a framework of bricks (320,5,6,8,9).

482 Yet the Romans appear to have had a weakness for the very ingenious system of the straight arch, whose Etruscan origin has been previously noted (page 233), but to which they added important improvements. They risked spans of nearly 16.4 ft., (15.9 ft. at the Theatre of Orange), trusting in the excellence of the stonecutting of the blocks set without mortar; sometimes they strengthened the bonding by projections entering r recesses cut in the joint surfaces themselves, even by the carving of tongues and grooves (320,12; 321,5). Besides, they almost always redwced the bending stress in a lintel or an architrave of the same kind by turning above it an arch to support the upper structure (320,12).

The same precaution was taken when the straight arch was made of bricks, like that to be seen at the Basilica of Maxentius, where the clear span is 5.9 ft.(320,9).

The Portico.

As an isolated, the pier was transferred by Roman construction; it was built of stone or bricks, taking care to proportion its section economically to those of the supporting parts.

It sometimes formed a column of a monolith of hard stone, g granite or porphyry; more frequently of a pile of drums of marble, hard limestone, and even of tufa; it was freely constructed of bricks, or even of concrete connected by a framework of bricks. In the execution of a stone shaft were successfully applied the Hellenic procedures, which we have previously explained (pages 290, 291), including the artifice of reducing t the bed surfaces of two drums to two outer rings. More careful than its rival, it multiplied the joggles of iron set in l

lead; it employed these even in the joint of the base and the stylobate. If the construction of a brick column must be apparent, this was -- witness those of the Temple of the god Rediculus and of the Amphitheatre Castrense -- very skilfully faced with materials of appropriate form (321,3); otherwise this consisted either of masonry filled with concrete, or of a framework of tiles, with intervals filled with concrete (321,1,2).

The crowning of a columnar portico was almost always realiz-
483 ed in the German fashion by means of a monolithic or voussoir architrave, and exceptionally by the aid of an arch. [1] In the East the known spans of stone beams vary from 13.1 ft. to a l little over 16.4 ft.; in the West they were somewhat greater. [2] To lessen the risk of fracture of the architrave, the Romans either cut it in a single course with the frieze, which increased the resistance to flexure, or rather by a happy application of their twofold principle of division of work and of constructing with a skeleton, they relieved the overhanging portion by treating the frieze as a horizontal arch, or in other words, dividing it into blocks with oblique sides set above t the isolated supports, and into intermediate thinner blocks, which were supported by their ends and acted as an arch (321,4).

Note 1. The architecture of Pompeii presents an example.

Note 2.

Temple of Antonine and Faustina.	13.1 ft.
Portico of the Pantheon	16.4
Temple of Mars Ultor	16.4
Temple of Sun at Baalbec	18.0
Great Temple of Baalbec	20.8

When the isolated supports were piers, connecting them by a arches was the rule, and Roman architecture realized this in
484 a masterly way, skilful in treating the junction of two or three arches at the same or different levels (321,6,7,8).

Because of the twofold economy of rough material and of stonecutting taken together, the system of construction in high courses, that we have noted in regard to the architrave, was likewise adopted for the rest of the entablature; thus at the Temple of Antonine and Faustina, two rows of dentils, the facia and the cyma, are detailed in the height of a single block.

The Pavement and the Covering.

The Romans generally formed a pavement by means of tiles.

Toward the middle of the 2 nd century B.C., they borrowed from Hellenistic architecture the syrtem of stone mosaic, that they placed on a bed of plaster extending over a layer of sand, itself laid on the surface of a bed of mortar. They protected themselves from the dampness of the earth and from cold by arranging beneath the tiles a space, that could receive a current of hot air from a furnace.

485 — For covering its edifices, Roman architecture had at command several systems, and it is quite remarkable, that if not entirely its invention, they were at least so fully perfected and so perfectly adapted, that they belong to it; indeed they are marked by that spirit of organization, simplicity and wise economy, which characterize and recommend its structural work.

In current practice, it was satisfied by ceilings in carpentry or by light vaults in mortar, strengthened by a lattice work of joists and reeds. The first of these systems was even employed for very wide aisles, as for Basilica Ulpia. In that case the material was sometimes metallic, of bronze and perhaps even of iron (317,1).

The Romans freely covered a narrow aisle by means of stone slabs, sometimes made lighter by recessing coffers in their under side; those still in place at the Amphitheatre of Arles h have a span of 10.6 ft. and a thickness of 1.48 ft.(324,2; 323).

The portico of the Temple of Vesta at the foot of the Palatine presents an example of a ceiling produced by abutting two slabs, one balanced on the wall of the cell, the other on the entablature of the oclonnade (324,1).

Exceptionally in the East and normally in Syria, an oblong space was divided into bays by the aid of arches perpendicular to the greater axis, and over these were set the ends of stone slabs (324,2-4).

Yet all the preferences of the Romans were for covering by vaults, indeed of all possible solutions, this lent itself best to the realization of the ideal vastness, revealed by their programmes of public buildings. Their principle was due to t the Etruscans, but they made such developments, that in regard to that part of architecture, the universal history of the art assigns to the Romans a place of honor in company with their rivals, the Byzantines, Persians of the Sassanian Epoch, and

Italian of the Renaissance.

They knew and practised all methods and systems; tunnel, horizontal, cross, cloister, niche and dome vaults; vaults in cut stone or in bricks and vaults in concrete of spalls and mortar. They understood how to combine in the same edifice several types and to realize their mutual junctions. But being practical, they avoided complex combinations and endeavored, without sacrificing any stability, to reduce to the minimum the preliminary works, the use of forms and the difficulties in execution.

As a masonry vault, the semicircular tunnel vault was preferred by the Roman school of the West. It was constructed with care, without connection by mortar, but strengthened by projections and cramps. It was distinguished by the ingenuity and the success of the artifices by which were produced a reduction of the number and the importance of the carpentry serving as centering during the construction. If a series of arches was necessary -- for example for a bridge, care was taken for each to be independent, in order to dispense with constructing as many centerings as there were units, and to be able to erect them successively with a small number of centerings, and if necessary, with a single one (324,8; 322). Better still, this single centering was reduced to the proportions of a narrow a and light arch centering; indeed the Amphitheatres of Nimes a and of Arles inform us, that instead of building a tunnel vault by starting from its springing along its entire length, it was formed by placing independent arches side by side (324,6). A third advance -- yet more remarkable, since it simplified the final construction as much as the preliminary -- resulted from an application to the vault of the very fruitful principle of the division of labor and of construction with a skeleton; as if their role was similar to that of the sides in the thoracic cavity of the body, the arches were spaced apart to serve as supports to a covering of slabs or of concrete; at once was s saved more than half the materials, labor and time (324,4,7).

The covering of the Great Temple of Baalbec, whose span of 74 ft. attests that the Roman school of the East equally understood how to construct a tunnel vault in cut stone.

In the West from the 1 st century A. D., construction in br

bricks was current, even at a great scale. The covering of an aqueduct at Eleusis shows that the Roman architecture of the East appreciated the procedure, that we have observed in Egypt and Mesopotamia (pages 71, 138), of the construction of a vault in portions. The western school preferred the system by r radiating courses, whose application also comprised the same economy in centering, as when the material was stone. Instead of a continuous centering, arch centres were spaced apart, on which were placed a series of large bricks measuring 1.94 ft. on each side; the whole of these formed the necessary centering.

Roman architecture was not embarrassed in covering by a tunnel vault an annuler aisle or an ascending gallery; in the last case it proceeded by developing a series of tunnel vaults, each springing from a higher level than the preceding one; besides the advantage of simplicity, this solution, an example of which is offered by the "Baths of Diana" at Nimes, further had that of facilitating the lighting (324,5).

An original type was characteristic of Roman construction a and was the horizontal vault, jointed on the principle of the horizontal arch; the ruins of the House of Augustus on the Palatine presents a realization of it, which after the lapse of 20 centuries still spans a space with a length of 11.5 ft. and a width of 7.9 ft.

Roman applications of the system of the cross vault in masonry are rare, at a small scale and confined to the East, to Pergamus and to Djerach. Their structure manifests that practical simplicity, that we have frequently had many occasions to admire; it indeed avoids the complications in cutting and the risks of rupture implied by the bent forms of the intersecting voussoirs, and it prefers the extension of one course into another (207,3).

Likewise for the cloister vault, resulting from the intersection of two tunnel vaults in cut stone without penetration of the jointing; it is only found in Syria and in Asia Minor. T The same for the niche vaults, whose realization in stone is peculiar to the eastern provinces of the empire, for example, notably at Baalbec, Djerach and Spalato. Finally similar for the masonry dome; it is observed in Asia, covering a drum -- witness the little circular Temple at Baalbec -- or surmounting

a square area -- examples of this are not rare in Syria; in t the last case the connection of the circular section of the calotte with the angular plan is obtained by the artifice of corbelling, realized either by placing slabs on the angles, or by constructing a pendentive in the form of a spherical triangle with horizontal courses.

Yet the properly Roman method of realizing these various systems of vaults was the formation of a shell of concrete of spalls and mortar with a framework of bricks. The procedure appeared after the 1(t century A. D.; its use and its fashion d date from the 2 nd century; until the decline of Roman art, it remained in favor and was applied with the hand of a master. It was simple and economical, and with certain precautions was excellent. On a carpentry centering was placed the material in horizontal and not radial layers; it was allowed to set and the centering was removed, and unless an earthquake or human malice interfered, this was ensured to last indefinitely -- witness the Pantheon and the Basilica of Maxentius.

The condition of success was a perfect stability of the concrete; during its construction and the setting, the least movement of the supporting centering caused cracks, and after the completion of the work, any movement of the spporting walls must produce ruptures with the resulting destriction. Against the second of these dangers Roman architecture protected itself by the expedient of strong abutments -- an external wall, as at the Pantheon, buttresses apparent or masked by the adjacent structures, as at the Basilica of Maxentius (319). The first danger was obviated efficiently by ingenious artifices in execution and by an application of its system of organic construction, divided into the parts of the framework and the filling.

And first, it understood how to dispense with an excessive preliminary carpentry. Instead of massing the concrete directly on the wooden centering, it commenced by forming on the surface of the latter a thin vault of large bricks two ft. square, covered by a second in materials of smaller dimensions, or even of rubble of small sizes, as the custom in Gaul. This shell permitted great economy in scaffolding while ensuring a firm support for the concrete (324,11).

491 A good construction of the latter was again facilitated by the care taken by the Roman constructor to first construct, s starting from the tops of the walls, brick arches converging at the top of the vault, frequently connected at regular distances by rings of the same materials, and also sometimes by arches; so that the wohle formed a skeleton, whose openings were filled with concrete (324,9,10,12). The advantages of the system are evident; an additional guarantee of the stability of the shell during its construction, ability to localize the pressures, and consequently a greater facility in providing the resistance. Generally were constructed open arches with two or three series of bricks connected at regular intervals by g great tiles; there resulted not only an economy of materials, but further a greater stability of the two elements of the vault (324,15,16).

In brief, an application of this procedure on a great scale, a masterpiece of simplicity and of logic, required but a small number of foremen, several masons to construct the facings and
492 the skeleton, a group of carpenters for erecting the centering and the firms, some eversees of the making of the bricks and lime, with an army of laborers to supply the works with materials. By this the Romans realized all the types of covering and in colossal proportions; tunnel vaults measuring more than 78 ft. clear span, such as those over the lateral halls of the Basilica of Maxentius; cross vaults 80 ft. square, like those covering the main aisle of the same edifice; hemispherical domes designed for a diameter of 142 ft., like that of the Pantheon.[1] (286; 308; 325; 326; 328).

Note 1. Let us cite as specimens of cloister vaults the octagonal halls of the House of Augustus on the Palatine, and as an example of niche vaults, the exedras of the Baths of garacalla, whose diameters measure 48 ft.

They further knew how -- for example, as proved by the great rotunda of the Baths of garacalla, the canopy and the Piazza d'Oro of Villa Hadrian -- to arrange the penetration of a concrete vault by secondary ones. They even came to place a dome on a drum pierced as a colonnade (324,8) -- witness the Mausoleum of Constantia (Church of S. Costanza).

The sole problem,for which Roman architecture has not proposed an elegant solution,is that of adjusting a calotte to a st-

structure when not circular. The pendentives exhibited by the
edifice termed Minerva Medica and the octagonal hall of the B
Baths of caracalla manifest as much uncertainty as inexperien-
ce. Yet those constructed of stone and to be seen in the rui-
ns of Djerach do honor to the school of Syria. [2]

Note 2. See in Volume II the pages devoted to the study of
Syrian construction.

The system of Roman roof coverings reveals to analysis the
smae conception and the same mastery as the other parts of the
construction.

If they had vaulted an edifice, the Romans were too sensible
to not avoid the superfluity of a roof; they limited themselv-
es to the application to the exterior of the vault of a coati-
ng of mortar, on the surface of which were fixed tiles. In t
the contrary case, they arranged for these the support of car-
pentry with two slopes projecting strongly from the walls; th-
is was composed of two trusses, whose construction was before
mentioned, and which were sometimes made of bronze. The cover-
ing was of terra cotta, fashioned in rectangular and slightly
concawe tiles with raised edges (tegulae) and joint covers (im-
brices), whose form was that of half a frustum of a cone divi-
492 ded along its main axis; these were often set in mortar on th-
eir support, and the last of a row exhibited the entire form
of an antefixa. The crestings and ridges of the roof frequen-
tly projected in form of rolls covered by tiles; the reentrant
angles were very practically protected by tiles of appropriate
forms in lozenge shape. The rain water was collected by gutt-
ers and ejected by spouts.

Monumental architecture sometimes substituted marble for te-
rra cotta, for example, as done for the Temple of the Sun at
Rome.

494 Chapter 5. The Effect.

Roman architecture was less successful in seeking for effect than in realizing programmes and in attacking problems of construction.

It exaggerated at first. Doubtless it must be praised for not having neglected these, even when its purpose was of the most modest utilitarian order; to have desired the access to a city, a square or a bridge, should be marked by a triumphal arch; for a market to be monumental; that the humility of public latrines should be relieved by marble seats and mosaic pavements. [1] Yet it lends itself to criticism for having contracted, towards the middle of the 1 st century B.C., a taste for luxury, that a hundred years later became a passion, and from the beginning of the 3 rd century A.D., rose to a frenzy of splendor.

Note 1. For example, see the Arches of Rimini, Timgad etc., the Gate Porta Nigra at Treves; the Bridge of S. Thomas in Provence; the Markets of Pozzuoli and Pompeii, etc.

It may still be reproached for having conceived the factor of effect as not an integral part of the edifice, but as an a addition, independent of the structure; which induced it, when it had adopted concrete construction, to regard relief decora-
495 tion as a species of this facing, and finally to reduce more and more the part of sculpture to the advantage of that of color, even of that of the appearance of precious materials.

Finally, we have to regret, that a school which was a model of ingenuity in the matter of plans and of construction, lacked decorative invention, was devoted to symmetry and kept within the Hellenic rut.

That does not mean that Roman architecture appeared without merit, when viewed in regard to the effect.

It is first necessasy to recognize that of having had its o own taste, a taste for what could impress, astonish and dazzle; more accurately, that for material grandeur, solemn majesty, substantial richness, composite arrangements, brilliant materials and polychrome appearance.

It can no longer be contested, that it very frequently approached its ideal and frequently attained it.

Particularly, it derived honor from the beauty of character

as well as from the number of its productions -- especially i its amphitheatres, basilicas, baths, aqueducts, commemmorative monuments -- retaining a perfect appropriateness for their purposes, a simple and strong structure, or again a colossal magnitude, the more striking that it was made more apparent by t the effort to realize the proportioning of the parts of an edifice, not to one of its parts chosen as a module, but to the scale of a man. [1]

Note 1. As examples of colossal programmes, let us cite:-- the porticos of the Roman Field of Mars (Campus Martius), which extended for a length of more than 2.8 miles on an area of 10.8 sq. miles; the Baths of Caracalla, that occupied 34.6 acres, the rotunda of the Pantheon and the vault of the great a aisle of the Basilica of Maxentius, respectively covered 16,200 and 21,600 sq. ft.; the Mausoleum of Hadrian, whose platform measured 276 ft. square, and its drum was 210 ft. in diameter.

I. Effects of Monumental Relief.

Roman architecture conceived the effect of relief in a picturesque key.

Thus it loved circular or polygonal plans, slender elevations, diversified and with movement, notably with orders in stories.

The form of a temple was frequently that of a rotunda. On a rectangular plan, it differend from that of the similar Grecian type by a greater slenderness resulting from a smaller l length, a greater height of the substructure, and to the limitation of this by vertical faces (333,1; 289; 293; 296), and finally to a greater inclination of the sides of the roof.

Likewise for the tomb. In the form of a mausoleum it was set on a square platform, a high drum surmounted by a truncated cone, on the summit of which rose a sculptured portion; [1] (330,3); in that of a chapel over a crypt, it was generally a rotunda and sometimes a polygonal prism (324,13); [2] finally in that of a monument, it was sometimes realized -- according to a formula common in Asia and Africa, from Syria to Morocco-- by a pile of prisms receding behind each other, the last being crowned by a pyramid (330,4); [3] Sometimes -- in the properly Roman fashion -- by the superposition on a substructure, a square prism, a cylinder, and a cone (330,5; 313); [4] the latter

being occasionally replaced by a mass in form of a trumpet or inverted funnel with concave outline (330,1,2).[5]

Note 1. See Mausoleum of Caecilia Metella, and those of Augustus and Hadrian.

Note 2. See the Mausoleum of the Flavians on the Quirinal, numerous tombs in the suburbs of Rome, Mausoleum of Diocletian at Spalato, and that of Constantia at Rome.

Note 3. For example, see the Tomb of Zachariah in the valley of Jehoshaphat and that of Dougga in Tunisia.

Note 4. See the Monument of S. Remy in Provence.

Note 5. See the Tomb of "Absalom" in the valley of Jehoshaphat and that of Igel near Treves.

Likewise again for the commemmorative edifice; when it was not a column or a triumphal arch, the latter then being of one or more arches required one to look upward, and that its summit received statuary (331; 314), it had the form of a mausoleum -- such as the Trophy of Trajan at Adamklissi; or that of a funerary structure in stories -- such as the Trophy of Augustus in Turbie.

492 Finally, let us note as indicative of Roman tastes, the addition of semicircular apses to basilicas and the frequent erection of temples and of markets on a circular or polygonal plan.

The care for impression is equally manifested in the Roman conception of the garden, which in truth in a certain measure found itself restricted by the mediocre resources in plants a and flowers at the disposal of the ancients.[1] It indeed aimed to strike the mind by a reversal of natural appearances and to amuse it by unexpected or complex spectacles. The means were the tracing of straight alleys, the modeling of the ground in terraces, plantings in lines or quincunxes; better still, an architectural or sculptural shape of the vegetation enclosed in lawns with geometrical outlines, surrounded by walls, pierced by openings, curved like vaults, cut into regular forms, even into images of objects; finally the association of architectural and sculptured parts with natural elements (298).

The Romans had at their disposal among plants, the box, laurel, pomegranate, myrtle, cypress, evergreen oak, several species of pines and firs, ivy and acanthus; for flowers, the rose, violet, crocus, narcissus, lily, hyacinth, poppy and amaranth.

II. Effects of Secondary Monumental Relief.

The secondary mounmental relief of Roman edifices announces, as much as their entire shape, the desire to strike the eyes; for the examples abound in outlines and in broken facades, even to excess. Such were the broken facades common in Syria, Arabia Petra, Africa and also at Rome, in the decline of the of the empire (335); such were the porticos with flights of s steps, indented in bastions by the penetration of stairways i into intercolumniations (333,2); such were the lanterns with colonnades dear to funerary and commemmorative architecture; (313; 335); such the false porticos realized either by the erection before a wall of columns attached to it by the entablature (295), or more simply an arrangement of pilasters or eng-
499 aged columns set before a pier or a wall to receive the springings of a cross vault; [2] and also the niches recessed in external or internal facades (286; 291); the projections of the profile of the substructure (289; 293), the deep coffers recessed in the ceilings and vaults (286; 351).

Note 1. See Theatre of Marcellus, Coliseum, and the walls of numerous cells.(333,5; 289; 307).

Note 2. See Triumphal Arch of Constantine, Baths of Caracalla (326), of Diocletian and Basilica of Maxentius.

The enclosures of the openings of doorways and windows contributed much to the animation of the walls; if rectangular, t they were frequently profiled with projections somedtmes decorated by ears, frequently enhanced by a cornice, supported or not by consoles (324). When instead of a lantil was an arch, Roman art had the good taste to derive an effect from the manifestation of its structural role; or indeed it limited itself to exhibiting the structure of its masonry by accenting the j joints and by marking the springing by the projection of an i impost; or rather it made this project beyond the plane of the wall by the artifice of an archivolt with projecting profile; finally it distinguished the keystone by assigning to it dimensions and relief exceeding those given to the remainder of the voussoirs (308; 314; 327).

500 III. Effect by Relief of Details. -- The Orders.

Without speaking of the pier, usually erected on a rectangular plan, Roman architecture disposed of no less than six ord-

orders; the three Hellenic on the one hand, on the other being one called Tuscan, derived from an Etruscan origin, one composed of the Ionic and the Corinthian and termed Composite, whose vogue commenced in the 3 rd century, and finally an invention of capricious character, contemporary with the decline of the empire. In fact it disdained the Doric, whose severity d did not correspond to its dieal of richness; it made little u use of the Ionic, whose elegance accorded badly with the pomp of its arrangements; on the contrary, it freely used the Tuscan, loved the Composite, and was passionately fond of the Corinthian.

501 As for the Grecian types, it was induced by its passion for effect to force their expression in relief by a modeling more contrasted and complex, and to strengthen them by the combination of elements borrowed from two of them; thus by placing a Doric entablature on a Corinthian colonnade. On the other hand, the care for economy of time and work inclined the Romans to prefer to the onerous refinement of curves intended to please the eye, the practical simplicity of those produced by a turn of the compasses.

When an arch was supported by columns, these received the i imposts, not directly on their capitals, but by the intermediate portion of an entablature (336;2; 343). Only in the extreme decline of the empire became customary a system of direct connection of the two elements, whose exceptional use is attested by the ruins of Pompeii before the year 79 A.D.(336,3).

502 Among the characteristics of the schools of Syria and of Asia Minor is counted a singular method of raising in the form of an arch the architrave of the middle intercolumniation of a facade portico (337,1); the Triumphal Arch of Orange exhibits a happier realization of the idea, resulting from a differentiation of the two elements.(337,2).

With exceptions -- there may be cited those shown by the Temple of Fortuna Virilis and the Theatre of Marcellur -- most Roman examples of the Ionic capital represent counterfeits mechanically executed. In the decline of the empire, they sometimes pleased themselves by heads projecting from the eyes of v volutes. [1] The entablature was distinguished from its Grecian prototype only by a reduction of the height of the frieze. Lovers of symmetry, the Romans did not give the caps of the a

antes any special form, but imposed on them that of the capital.

Note 1. See the ancient capitals used again in the church of S. Maria in Trastevere.

Tuscan Order.

Almost always, the Tuscan column was provided with a base,
533 whose form varied from that of a simple enlargement of the shaft to that of the most detailed of Ionic bases (338;7,9).

The shaft, whose height increased as the career of Roman architecture developed, [1] was slightly conical, frequently smooth, otherwise grooved by 20 to 24 flutes, that were sometimes filled by cables for the lower third of their height.

Note 1. At first equivalent to 7 diameters, finally equal to more than 12.

The canonical capital consisted of a square plate, joined to the shaf by an intermediate moulded cushion, either with the practical profile of a quadrant, or according to the wavy cyma. But they loved to enrich the outline by cutting a hollow and making the mouldings more complex (338,1-4).

The Tuscan entablature recalled the grand lines of that of
534 the Doric order, but modified the proportions and the character. On the whole, it was lower than its model, the reduction affecting the frieze less than the cornice and the architrave. At first these exhibited a plain face -- an example is presented by the Theatre of Marcellus; but under the empire its surface was broken by the projections of bands stepped in Ionic fashion. Less refined and more practical than its Hellenic p predecessor, Roman art did not embarras itself by an elegant solution of the problem set at the end of a Doric frieze (page 345); it permits this to terminate in a fractional metope, doubtless for the season, that the reduction of the last intercolumniation required by the Grecian system with an angle triglyph, introduced a complex requirement and a lack of symmetry, equally repugnant to its taste. On the other hand, because t this produced an effect, it voluntarily took the trouble to g give the triglyphs a strong projection beyond the surface of the architrave (338,6). As for the cornice, excepting in regard to the ratio of relative height, it was sometimes conformed to the Grecian type, sometimes differentiated from it by t the addition of dentils, or by the suppression of mutules; fi-

first simple and firm, its profile became more and more detailed after the decline of the republic.

505 Corinthian Order.

Roman interpretations of the Corinthian order are distinguished from those realized by the Greeks by peculiarities, that all aid in the enrichment of appearance. Those contemporary with the 1 st century B.C. are admirable, -- for example those presented by the Temple of Vesta at Tivoli (340), the portico of the Pantheon, the Maison Carree at Nimes, and the Temple of Mars Ultor (341); several are entirely worthy of attention, -- such as those revealed by the remains of the Templesof Vespasian, of Venus and Rome, of Antonine and Faustina, and of the Sun (348); but also the conception does not fail to be in bad taste and the execution is mechanical.

The ratio of the height of the column to its diameter was ordinarily 9 1/2 or 10 to 1.

The base was of the Attic type, placed on a square plinth a and quite frequently decorated by additional mouldings (348).
506 Sometimes, -- and frequently when it belonged to an ornamental column, set beforea wall -- it stood on a pedestal, whose height might equal one-third of the total height, and which formed a powerful factor in the picturesque effect,of which the Romans were so fond (327). [1]

Note 1. Notably on the triumphal arches.

Slightly conical, sometimes with and sometimes without entasis, unless its material was of hard stone, the shaft was channeled by 24 flutes, the lower parts of which were sometimes r raised by rounds. There also occurred a development of grooves in spiral form with symmetrical scholls of historical bands, inserted in a recess enhanced by reliefs or even by the imitation of the trung of a tree. In Syria, a console projecting at mid-height doubtless served as a support for a statue.(333,3).

Sometimes -- witness the order of the Baths of Agrippa (315) and that of the upper story of the Coliseum -- the capital recalled the simple type with lanceolate leaves, of which an example is offered by the Theatre of Dionysos at Athens (page 3
507 364; Fig. 247,1); but as a general rule, it was fashioned according to the finished formula of the acanthus bell. At first equal on the average to the mean diameter of the shaft, its h

[illegible]

a typical example [illegible] is [illegible] by the order of Tivoli ([illegible]); later [illegible]

[illegible]

[illegible] as it [illegible] been [illegible]

[illegible]

Plate 1. See the [illegible] of the Temple of [illegible]

the capitals of the Temple of [illegible].

[illegible]

[illegible] than of a [illegible].

[illegible]

[illegible]

Roman Doric. -- [illegible]

[illegible]

height increased by one-third -- by reason of an endeavor to make the second row of leaves equal to the first. After having been carved in the image of the curly acanthur, the foliage assumed the more toothed and dryer appearance of that of the olive. Under the republic, the space between the volutes was furnished with a large wild rose flower in the Etruscan tarte, a typical example of which is presented by the order of Tivoli (340); later this motive passed to the section of the abacus while losing its dimensions. Sometimes it was replaced by the figure of an eagle, by a person or a trophy; they likewise loved to substitute for the volutes rams, winged horses, griffins or dolphins, whose outlines were similar to those of the f former (342; 348). [1] There are examples -- the Arch of Augustus at Aosta furnishes one -- of capitals contracted above the row of acanthus leaves, as if it had been desired to create t the appearance of two bouquets, the upper emerging from the l lower one.

Note 1. See the pilasters of the Temple of Mars Ultor and the capitals of the Temple of Concord.

For the capital of the ante, the Roman Corinthian comprised no form other than that of a flattened capital.

The Romans did not object -- witness passages of Vitruvius and the Arch of Augustus at Aosta, to cite a single example-- to crown a Corinthian colonnade by a Doric entablature; but t the rule was to employ the Ionic in treating it for effect. To render the profile more impressive, to multiply and diversify the reflections of the light and strengthen the shadow, the s surfaces were inclined backward, the soffits were made more or less inclined, and the frieze was profiled in a convex or wavy line, the cornice was extended in height, even to become equal to the sum of the architrave and the frieze, and it overhung so much, that it was necessary both to lighten it by recessing coffers, and to support it by corbelling out medillions or consoles set over dentils or even projecting from the frieze. [1]

Note 1. Thus at the Coliseum.

Composite Order. -- Fanciful Orders.

The Composite order, characteristic specimens of which are presented by the Baths of Caracalla and of Diocletian, differed from the Corinthian only in the form of the capital. That

resulted from the development of the Ionic type with ornamented necking, of which the Erechtheion offers a splendid example (244), or if it be preferred, of a perfected and sumptuous application of the elementary formula of the bracket set on a b bell, which we have mentioned in our study of the origin of t the Ionic order.(Pages 356-366,367). A normal capital with h heavy diagonal volutes surmounted a bell, whose lower portion was marked by two rows of acanthus leaves, and the upper zone was enriched by foliage, flowers, figures, and by various motives (343; 346).

As an example of hybrids, we may further cite a carved capital at Kanawat in Syria or a Tuscan capital appearing to emerge from an acanthus bell, and a Roman capital, where above a band of the same foliage, four victories appear to support the angles of the abacus, while between them project trophies and arms (346).

Note also that the productions of the schools of Syria and of Africa indicate a weakness for hybrid arrangements, [1], and that the Egyptian cornice was the type of the crowning in favor south of the Mediterranean, from the desert of Syria to the straits of Gibraltar.

Note 1. See the elevation of the Tomb of Absalom, that superposes on an engaged Ionic colonnade an architrave and a Doric frieze.

IV. Effects of Ornamentation.

Of all effects permitted to the art of building, that of ornamentation was most appreciated by the Romans; likewise they adored it.

And first they were lavish with those resulting from choice materials carefully decorated; it may be said, that they had a passion for everything that shines.

Thus it was the rule that a wall should at least be coated with stucco. The operation was conducted with as much skill as conscientiousness, and it comprised the application of three to six layers, first of mortar more or less fine, then of a paste of lime and marble dust, with a perfect polishing of the latter. If the surface were concrete, its roughnesses were expected to retain this coating; if they were of stone or brick, adhesion was favored by driving in nails or by cementing thin bits of marble in the supporting wall.

No less attention was paid to the execution of marble facin-
gs, that the Romans greatly loved, and whose use on a great s-
scale is one of the characteristics of their architecture. T
The slabs were held to the wall by a layer of cement and reta-
ined by metal champs and anchors (322,2).

The vaults were covered with stucco, sometimes with mosaics
of marble or of glass.

As for the floor, it was sometimes composed of a very smooth
layer of stucco, more frequently of a marquetry of small cubes
of marble set on a bed of mortar, supported by a layer of con-
crete, itself superposed on a bed of ballast; after the work
was completed, the crevices were filled by covering the surfa-
ce with a cream of mortar of marble, and finished by careful
polishing (347).

Such as we have defined it, Roman taste must be satisfied by
the gleam of metal; indeed platings of bronze were freely made;
thresholds; tiles as at the Temple of Vesta at Rome; doors li-
ke thoseo of the Pantheon are still in place (334); capitals --
there may be again cited as examples, those of the edifice be-
fore mentioned, and also those at Djerach and at Palmyra, whi-
ch were economically composed of a stone nucleus and a metal
covering. Applications of gold were equally in favor.

57 Finally, when the client could afford the cost, domestic ar-
chitecture of the imperial epoch employed ivory and even prec-
ious stones!

As much as to the reflections from polished materials, the
Romans were sensitive to the attractions of color, and yet mo-
re to the prestige of a varied polychromy.

They tinted their stucco coatings, either by spreading the
coloring matter over their surfaces while still fresh -- that
was the usual procedure, when it was only necessary to apply
a lime wash -- or by placing on the dry coating an adhesive
liquid charged with pigments, or rather by covering the surfa-
ce with melted and colored wax, that the reat of a brazier fin-
ally incorporated with the surface of the wall. Guided by a
very correct sentiment for the effect, they sought for warm t
tones, frank tints and contrasted harmonies; their palette was
charged with white, black, reddish brown, ochre, blue, green,
yellow and red.

They enjoyed elsewhere an amateur's polychrome mosaics, and they understood how to derive a color tone from visible construction in bricks, either by setting yellowish tiles with red
572 mortar -- the "Temple of the god Rediculus" offers a typical and successful example -- or they contrasted light yellow bricks with others of a warm red shade.

Yet to the splendor-loving eyes of the Romans of the empire, no polychromy equaled that of white marble and hard stone as the elements. Indeed they disposed of an extended scale of b brilliant tints; frank tones like the red of the marble termed "antique red" and of certain sorts of porphyry and granite; t the green of serpentines (antique green), or certain basalts, porphyrys and granites; the black of basalt and of "taenarium" marble (antique black); complex tones like the orange-yellow of the marble of Numidia, or the medley of red, brown and green of the marble of Iasos. And the magnificent effect of these various materials was again multiplied by the composition of variegated harmonies by means of marquetries skilfully pat-
573 terned, and by the variegation of columns, for example, whose
574 bases were of white marble, the shafts of colored marble, of granite or porphyry, and the capital of white marble or even of metal.

V. Effects of Decroation.

Roman architecture used and abused effects of ornamentation. It demanded from it refinements of masonry jointing; such as that reticulated arrangement previously mentioned; that recessed jointing actually executed or imitated by sinking in a coating of stucco (349; 393); again the happy solution proposed for the problem of combining the joints of voussoirs with the beds of the adjacent courses.

It particularly loved to compose with clay tiles geometrical figures, and still more -- in the Alexandrine fashion -- with the elements of mosaic or marquetry of marble, drawings and p paintings, many of which are masterpieces of taste and execution; sometimes these were thin blocks of varied colors, employed as a painter does touches of color -- in this case the work was called "opus tesselatum" or "vermiculatum"; sometimes the work then took the name of "opus sectile"-- the material was cut according to the outlines of the motives to be represented. (347).

Roman architecture was prodigal with ornamentation in relief, even to overloading, confusion and unsuitability.

It ingeniously complicated the outlines and multiplied the pretexts for goldsmith's work in stone. Jambs, arches and mouldings were frequently covered by sculptures (348). The entablature was especially ornamented, its projections wrought, its horizontal arches being decorated by motives of scholls ((311; 339). The severity of the Tuscan order was corrected by luxurious ornamentation; beads on the mouldings, leaves in the hollows, eggs on the echinus, rosettes in the panels of the l lower surface of the abacus; pateras, rosettes and ox-skulls on the metopes of the frieze; frets on the edge of the facia etc. [1] (338,4; 339). They came to pretty things like the drops carved in the time of the Flavians in the spaces between t the dentils. [2] The profusion was greater when very frequently the motive resulted from the modeling of a coating of stucco or plaster, and even if the work of the sculptor, the execution was in the greatest measure mechanical. In these conditioons, the work of the Roman ornamentists risked being, and frequently was tainted with coldness and dryness. Yet the art of the republican epoch understood how to create profiles of admirable firmness -- such as those of the Temple of Vesta (296), and that of the imperial period produced exquisite decorations of friezes and panels, in the first rank of which are counted the specimens offered by the ruins of the Ara Pacis of Augustus and of the monuments of the south of France (315; 344; 345).

Note 1. See the remains of a column and entablature found at Rome in the ruins of the Regia.

Note 2. For example, see the Temple of Vespasian (339).

The school of Syria is distinguished by a special style, characterized by a weak and uniform relief of the sculptures, an execution firm and rather dry, an appearance of cutting analagous to that of work in metal, all peculiarities which will a appear to us as distinctive of Byzantine decoration. (Vol. II).

The repertory of ornamental Roman sculpture comprised on the one hand, an abundance of geometrical elements or very conventional ones of Hellenic importation, such as beads, eggs, heart forms, spear heads, rosettes, acanthus or lanceolate leaves, the latter being very common; on the other being an important

collection of naturalistic motives taken from the native flora and fauna; leaves of laurel and oak, vine branches, honeysuckle, hawthorn, rose, lily, poppy, fruits, small animals, birds and insects. The human figure was far less utilized than in Greece. Roman taste was satisfied by the development on a facade, particularly on a frieze, of inscriptions, otherwise recommended by the beauty of the characters and skilful placing.

With mosaic, painted ornamentation succeeded best in Roman architecture. For from it was derived charming effects, admirable for richness of invention, harmonious variety in composition, elegance of form, pleasing motives, freedom and vivacity in coloring, and finally sureness in execution. It loved first the compositions of an architectural character, then under the influence of Alexandrine taste, sacrificed more and m more to caprice, and ended by pleasing itself by the most Barocco inventions.

The ordinary arrangement of a mural painting comprised the distinction of three zones in a vertical sense. A dado, averaging a sixth of the total height, was ket in a dark tone; at first treated in the image of an architectural elevation, it was later divided into panels variously colored. At top was formed a light frieze, sometimes white, relieved by running o ornamentation. The intermediate surface was frequently divided in three panels; the middle one was narrower and exhibited a fanciful architecture, that often enclosed the representations of a mythological subject, a genre scene or ideal landscape; the decoration of the two lateral surfaces was more simple, generally composed of small paintings or of medallions, in which was inscribed a head, a cupid or birds. Ordinarily the o ornamentation was carried out in clear yellow, red, green and white on the darker grounds tinted a warm red or brown, frank blue or black; but sometimes the arrangement of the harmony w was inverted. Frequently the effect was enhanced by reliefs in stucco or plaster, sometimes modeled by skilful and ingenious fingers. The entire appearance pleased the eyes and amused the mind.

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See the original text of the work.

(Omitted by accident from page 135, as there noted).

Finally, from the "middle Minoan" epoch, a palace possessed a theatre, formed by steps rising as a border around an area paved with slabs, and which doubtless served for plays and dances. (116; 119).

In regard to the house, its form and arrangement as revealed by the representations presented by the faience plaques discovered at Cnossos recall European rather than oriental types; they indeed comprise stories and windows on the facade, and even roofs in two slopes, sometimes surmounted by a lookout(120).

Crete realized a modest sepulchre by excavating in the rock a chamber at the end of a corridor; by constructing underground with stone slabs a cist 3.28 to 4.25 ft. long, 2.3 to 3.28 ft. wide and about 3.28 ft. high; or again by excavating at the b bottom of a well a side recess. A monumental programme, specimens of which are offered by the great Tomb of Isopata and t that of Hagia Triada, involve the construction of a subterranean funerary chamber of rectangular plan with a vestibule and a passage for access.[1]

Note 1. The Tomb of Isopata measures 25.7 ft. in length, 19.9 ft. in width and 26.2 ft. in height; the vestibule is 22.1 ft. long and 5.4 ft. wide; the dimensions of the passage are 78.8 and 6.6 ft.

IV. Construction.

Primitive Cretan construction appears to have employed no m material other than wood; when developed, it continued to make a considerable use of this.

Likewise for earth; the utilization of it was ancient, constant and regular, either for the filling of a framework of carpentry, for the preparation of a concrete of rubble, or for m moulding crude bricks, whose dimensions as found at Cnossos a are 17.7 ins. square with a thickness of 4.7 ins.; or finally, for the manufacture of a very fine and well burned pottery, t that can be appreciated from the sewer pipes uncovered at Cnossos.

Yet stone construction was familiar to Cretan architecture. At first, according to the "first" palaces of Cnossos and of Phaestos, it was limited to easely cut gypsum; in the epoch of the "second" palaces at the same places, -- doubtless as a res-

result of perfected tools -- it preferred limestone, at least for parts exposed to the weather.

If the treatment of the rubble was very crude, often being limited to simple roughing, on the other hand the cut stone w was the object of the greatest care, being defined by well dressed surfaces and sharp edges (114). Current dimensions were; in length 3.28 to 4.92 ft.; in width from 1.64 ft., and in height from 1.64 to 2.4 ft.; but lengths of 5.6 to 8.2 ft. and heights of 3.28 ft. were not rare, and they were not embarrassed by shaping great monoliths, such as those in the walls of the storerooms of the Palace of Cnossos, which measure up to 13.1 ft. long, 2.4 ft. wide and 3.28 ft. high.

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